

Sustainability on Display: Semiotic Analysis of Sustainable Fashion Visual Merchandising

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2020

ABSTRACT

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TITLE OF THESIS Sustainability on Display: Semiotic Analysis of Sustainable Fashion Visual Merchandising

DEPARTMENT School of Arts, Design and Architecture

DEGREE PROGRAMME Creative Sustainability

YEAR 2020

NUMBER OF PAGES 115

LANGUAGE English

Objective of the Study

This study aims to explore how sustainability in fashion supply chain from websites of mid-to-high-end fashion brands reflects in their window displays from the perspective of semiotics. On the one hand, window display is an important part of visual merchandising. On the other hand, transparency of information of sustainable supply chain of fashion brands is increasingly important in the establishment of brand image, and consumers pay more attention to information related to brand sus-

tainability. However, there are few studies on how to express sustainability in fashion supply chain on websites through visual merchandising of the window displays of fashion brands. This research enriches the theory in this field by studying the windows as a medium for sustainable information transmission of fashion brands. The main research question of this study is: how sustainability in fashion supply chain is reflected in the mid-to-high-end brand fashion window displays from the perspective of semiotics?

Methodology

Informed by a literature review on visual merchandising and sustainable fashion supply chain, this study adopts a semiotic analysis method to analyze the seven windows of mid-to-high-end brands communicating sustainability. The author applies the semiotic model proposed by Roland Barthes (Barthes, 1968; Chandler, 1994) to the window system to generate “Model of Semiotic Analysis” as well as summarizes how the investigat-

ed fashion window displays use visual merchandising methods to express their themes.

Findings and Conclusion

According to the semiotic model, the author provides analysis based on the three aspects of the visual symbols of the window system, the visual merchandising method and sustainability in fashion supply chain from websites. Findings suggest that the answer to the research question is two-fold. First, the sustainability in fashion supply chain from the perspective of environment and consumer service are predominantly reflected in the website and window design of sustainable fashion brands. Second, in the window with the theme of expressing sustainable supply chain, a) prop is the most popular visual object, followed by texture, and b) rhythm is the most popular visual merchandising method, followed by line.

Keywords window display, semiotics, visual merchandising, sustainability, fashion, supply chain

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1 INTRODUCTION

1 INTRODUCTION

1.1 Research Background

With the advent of the era of personalized consumption, people's requirements for the value added products are increasing (Ravasi & Rindova, 2008). To satisfy the functional requirements of goods, people are increasingly eager to pursue the beauty and uniqueness of in appearance as well as the cultural and symbolic meaning of the goods (Lizardo, 2008; McCracken, 1990; McCracken, 1986). The symbolized goods are endowed with additional meaning beyond the use value, which includes the social status, the expression of value orientation and the establishment of emotional needs (Yurchisin & Johnson, 2004). Fashion is the new standard of living for people in today's consumerist society (Beard, 2008). In addition, fashion is the output of business needs (Skov, 2006). In the context of such symbolic and fashion consumption, we need to systematically analyze, organize, compose and redesign the symbolic meanings of the fashion display elements in the fashion space, so that products and fashion spaces can convey this better to consumers (Das, 2014).

With the continuous development of e-commerce and information technology, the retail industry is also faced with an ever changing landscape. The impact of this change is to the retail industry

is the need for change to the approach in transforming and promoting sustainable social and economic development (Nwoffiah, 2005; Reinartz, Dellaert, Krafft, & Varadarajan, 2011). PricewaterhouseCoopers (PwC, 2019) reported that 46% of consumers prefer to purchase in offline shops, especially for products such shoes and clothing. For customers who like to shop online, convenience is the main driving factor. In comparison, one advantage of offline shopping is that it provides an authentic and tactile experience. Thus, offline stores and window displays need to update and re-define the function to attract customers (Bhatti, 2014). Offline shopping is a very essential experience of the daily lives of some people. People are often willing to spend time and money to go to a shopping mall, because it is not only a great chance to relax and build relationship with their friends, but also can be seen self-defining and self-establishing process and behavior (Ali-Kovero, 2016).

Studies have shown that there is a lot of waste in the global fashion industry with the current existing business models which is a threat to the sustainability of these business models as well as the supply chain of mid-to-high-end fashion brands. Many mid-to-high-end and luxury brands have strived over recent years to increase the sustainability in the supply chain (Dybdahl, 2016). Implemented initiatives have been beneficial to environmental and social sustainability. Some companies have even begun

to publish relevant information regarding their approach to sustainability of their supply chain on their official websites (Kim & Hall, 2015).

Researchers have found that people who pay close attention to environmental issues are often eager to know more about the value of the goods, including sourcing of the materials and the impact on the environment (Jain, 2019). Consumers want to know the impact of their consumption behavior on the environment, that is, they are looking for feel-good or guilt-free consumption opportunities (De Angelis, Adıgüzel, & Amatulli, 2017; Amatulli, 2017; Ham & Han, 2013). Furthermore, people want to be socially aware of their own environmental sustainability and social responsibility. The “want be to aware” provides high-end companies with a good opportunity to deepen the concept of sustainability into a brand image and culture in order to generate a mutual promotion with consumers.

At present, most academic research on fashion window and store design mainly focuses on exploring the influence of in-store consumer behavior by window and store environmental factors. Lange, Rosengren, & Blom (2016) argue that creative and artistic expressions and visual patterns that are conducive to understanding can make people feel happy in retail space and window designs, thereby increasing people’s desire to purchase in stores. So far, a large number of studies has demonstrated that

visual merchandising in the windows affects the behavior of customers, but there are only a few studies which analyze the relationship between visual merchandising and the theme expression of the window and how they affect each other (Davies & Ward, 2005; Morgan, 2011). Most studies have introduced the method of visual merchandising of the window from the perspective of spatial composition, however, research lacks analysis on the concept of visual merchandising and brand window from the semiotics perspective.

At present, research in the field of semiotics is mainly concentrated in the fields of communication, consumer and design. In the field of communication, many semioticians have talked about the relationship between semiotics and communication. Semiotic theory can be used to explain the meaning of the disseminated in communication. Saussure applied semiotics to communication to explain the meaning behind language, and for the first time proposed the concepts of signifier and signified. Roland Barthes (1968) further applied Saussure’s semiotic theory in linguistic communication to semiotic consumption and fashion design. He applied the content of semiotics in consumer science (Barthes, 2013). Barthes proposed the concepts of sign, signifier and signified. He believed that sign refers to the result of the behavior that signifier and signified would produce in the real environment

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(Barthes, 2013). Barthes brought the concepts of signifier, signified and symbol in semiotics into the French capitalist consumerism society and interpreted the essence of the consumption phenomenon.

In the field of design, the application of semiotics mainly appears in the field of fashion, product design and graphic design. Roland Barthes does not only limit Saussure's application of semiotics to the field of linguistics but also applies the theory of semiotic signifiers and referents to the visual system of clothing. He believes that when wearing clothes, people are also using a visual language to talk to and communicate with others (Barthes, 2013). This laid an important foundation for the development of semiotic theory in the field of vision. Since then, semiotic models have been widely used in the fields of graphic and product design to extensively analyze the meaning of product expressions. In the field of graphic design, semiotic analysis is mainly used to analyze the relationship between visual symbols and brands as well as the social significance established by visual symbols (Thurlow & Aiello, 2007; Bevins, 2014; Van & Jewit, 2001; Kindborg & McGee, 2007; Page, 2006). In the field of product design, semiotic analysis is used to interpret the relationship between the components of the product, the user and the environment. (Opprud, 2004; Vihma, 1995; Krampen, 1989; Mattozzi, 2007). A small number of semiotic

analyses have been used in the study of visual communication and visual merchandising in the field of fashion, most of which take flat patterns as the carrier (Rachman, Hamiru, Umanailo, Yulismayanti & Harziko, 2019; Morgado, 1993; Taylor, 1998; Rhodes & Zuloago, 2003; Almeida, 2009; Kretz, 2010; Danish & Kousar, 2017), very few articles use semiotics to analyze fashion space, such as window display (Ye, 2016).

There are currently very few reports that utilized semiotics to analyze communication of sustainability in marketing. These are the only studies on the communication of sustainable information in the corporate image of fashion brands (Cervellon, 2013; Hürmeriç, 2015), as well as the relationship between the communication of cultural sustainability and the visual environment (Ma, 2008). Therefore, this study of semiotic analysis relates to brand sustainability mainly analyzes the sustainability of brand culture communication, and the lack of discussion on the information of the sustainable supply chain conveyed by the brand.

Literature shows that in the different parts of the supply chain, the current high-end brands reflect various aspects of sustainability in the supply chain, such as environmental material selection, product transport efficiency, sustainable packaging design, social responsibility to provide employment opportunities, and environmental protection in

industrial parks and so on. In the planning phase of the supply chain, mid-to high-end brands and luxury companies began to limit the use of resources (Kapferer, 2006; Janssen, Vanhamme, Lindgreen, & Lefebvre, 2014). According to Janssen et al. (2014), the scarcity of the luxury brand products can make consumers more responsible and reasonable consuming, which can better protect natural resources. The rarity of luxury brands can be understood as the nature of sustainability (Joy, 2013). In the stage of obtain of the supply chain, mid-to high-end brand companies use more environmental-friendly materials in the selection of materials, such as the famous Italian brand Sergio Rossi. The leather materials of Sergio Rossi used in the package are selected according to the highest ecological standards on the market (Amatulli, 2017). At the storage and transportation stages in the supply chain, many mid- to high-end brands such as the Kering group, are beginning to seek more efficient and sustainable ways. They have purchased carbon credits from Wildlife Works Carbon (WWC) to monitor the efficiency of the company. In the distribution phase of the supply chain, modern luxury companies have become aware of the need to start using recyclable packaging. A typical example is the champagne brand Veuve Clicquot, they have designed a degradable bottle cap made of potato starch and recycled paper, which can also preserve the heat of the wine. This design reflects not only the company's high-end quality image, but also the company's

sustainable and socially responsible business philosophy by combining aesthetic, functional and sustainable concepts. At the service level, mid-to high-end brands and luxury goods companies not only bring consumers services, but also bring benefits to employees and the communities where they are located. For example, the Italian Brunello Cucinelli brand transformed an abandoned factory into an industrial park with a good natural environment, providing a good living environment for employees and surrounding residents. It also reflects sustainable communication through product design and through operations.

Relevant literature has explored the relationship between environmental sustainability, consumers, and brands. Research shows that the more consumers concerned about environmental sustainability, the more likely they are to consume sustainable products and products with green concept (Choi, T. & Cheng, 2015). Consumers want to understand the relevant green strategy information of the brand and how to use environmentally friendly products correctly. Helping consumers to understand the green strategy behind the brand can not only cultivate their sustainable environmental awareness, but also help brands attract more consumers. There are also studies showing that consumers pay closer attention to companies with high-confidence green business strategies (Spack, Board, Crighton, Kostka & Ivory, 2012). In addition,

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green brands can more effectively build emotional connections with customers which makes it easier to build relationships with consumers.

At present, more companies and brands place importance on sustainability in the process of planning society, production, processing, and sales (Dangelico & Pujari, 2010). For example, using recyclable raw materials for reprocessing, and using scientific methods to extend the service life of products (Ljungberg, 2007; Cooper, 1994). However, the current trend of sustainable fashion supply chain transmission channels is concentrated on websites, and a few will be reflected in the brand window displays – the media that customers physically and experientially engage with. In addition, there is a lack of theoretical research to guide how to disseminate information about sustainable fashion supply chains.

With the rise of offline consumption trends, shop windows are the first brand space carriers to convey information to consumers when shopping (Oh, H., & Petrie, 2012). A window display can establish a connection between consumers and brands in the shortest time as well as being the first bridge between consumers and enterprises (Sen, S, Block, L. G., & Chandran, 2002). Therefore, it is valuable to study how sustainability in fashion supply chain is also reflected beyond the websites, in the window displays of fashion brands.

1.2 Research Objectives and Questions

This study aims to explore how sustainability in fashion supply chain from websites of mid-to-high-end fashion brands reflects in their window displays from the perspective of semiotics.

RQ:

How sustainability in fashion supply chain is reflected in the mid-to-high-end brand fashion window displays from the perspective of semiotics?

RQ1:

What kind of sustainability in fashion supply chain is communicated through the current mid-to-high-end fashion brand window displays?

RQ2:

What are the visual symbols that reflect sustainability in supply chain of mid-to-high-end fashion brands?

RQ3:

How do these visual symbols function in conveying sustainability of supply chain?

1.3 Structure of the Thesis

This chapter introduces the importance of fashion brands to convey sustainability in the fashion supply chain from websites through the window and illustrates the research problem and thesis framework.

The second chapter reviews the literature related to the expression of value creation of fashion brands, visual merchandising and sustainability in the fashion supply chain, then summarizes 25 principles of sustainability in the fashion supply chain and puts forward the semiotic analysis method to analyze the window.

The third chapter introduces the data collected and the research methods. The feasibility of applying the semiotic analysis method in window design is further illustrated in the research method.

The fourth chapter uses the semiotic analysis method to analyze the seven shop windows collected in chapter 3, combining with the relevant theories of visual merchandising and sustainability in the fashion supply

chain analyzed in chapter 2, and sorts out how the visual symbols of the shop window system express sustainability in the fashion supply chain from websites by using visual merchandising method.

The fifth chapter discusses the research results based on previous literature and answers three sub research questions respectively.

The sixth chapter summarizes the results of the study, and expounds the practical significance, limitations and suggestions for future research.

2 LITERATURE REVIEW

2 LITERATURE REVIEW

This research project focuses on window displays in mid-to-high-end fashion brands that convey sustainable fashion information, and this chapter states the relevant literature and theoretical knowledge. To be specific, subchapter 2.1 explains the importance of window displays in the transmission of fashion brand value, as well as the importance of specific methods of visual merchandising in the field of fashion display. Subchapter 2.2 elaborates the relevance of sustainability in fashion supply chain and summarizes 25 principles based on relevant literature. Subchapters 2.3 and 2.4 introduce the current status of the use of semiotics in window display, design and proposed “Model of Semiotic Analysis” to analyze the visual elements of the window.

2.1 Visual Merchandising within Fashion Context

2.1.1 Value Creation within Fashion Context

The establishment of the core value of fashion and luxury brands has been suggested to consist of three aspects: Creative process management, Sustainable supply chain management, and Online and offline communication integration for mid-to-high end fashion consumers as the core value (Brun, 2017).

Creative process management emphasizes the importance of cultural value creation in fashion product design. Firstly, the role of value creation in fashion design is to serve as a bridge between the development of social culture, social phenomena, and social material. Bertola, Colombi, and Vacca (2017, pp.159-188) clearly demonstrated that constructing social value in fashion products and embedding contemporary cultural connotations in the design process of fashion products was the core of fashion product design. They suggest that fashion is a study of lifestyle trends. Designers should maintain a keen insight into the target market and actively predict the development trend of people’s aesthetics and lifestyles. On this basis, it is easier for designers to more convincingly create new values for fashion products, which leads the development of social culture. Secondly, the consumption behavior of consumers are not only the exchange of material environment, but also turning to exchange culture and value. For example, one of the design strategies of luxury brands is “strengthening products’ iconization” (Bertol et al., 2017, pp. 159–188). The product matches the market trend in a narrative way, including storytelling about the products (ibid.). In contemporary society, in addition to simply following consumerism, the purchase of luxury goods is a cultural choice and an expression of their own identity and personality (Amatulli & Guido, 2011). As these examples suggest, the cultural connotation of high-end fashion products is particularly

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important. For the company, in the process of creative process management, the relationship between art direction, creative direction and retail management is crucial to the development of the brand. In terms of the innovation of cultural connotation of fashion products, it is conducive to the sustainable development of the brand to use core cultural values to drive design and sales.

In the increasingly competitive international market, the sustainable development of the supply chain is conducive to establishing a credible corporate image. Firstly, Brun (2017) reasons that an efficient and green supply chain can not only improve the operational efficiency of enterprises, but also enhance consumer trust in the brand (pp. 189–216). The author suggests that with the continuous improvement of the sustainable consciousness of customers, the positioning of enterprise's sustainable supply chain will become a core value to attract consumers. Secondly, the promotion of corporate sustainable supply chain can better attract consumers. With the development of electronic technology and information technology, consumers wish to know more about the products they purchase, including information on production, sales and distribution, as well as how their consumption behaviors can affect enterprises or society (Brun, 2017). Since the shop window is the first and the most direct medium to convey the corporate image and corporate related

information to the consumer, it is worth investigating and summarizing how to use visual expression and visual merchandising to express a sustainable supply chain in the shop window.

In terms of online and offline communication integration for mid-to-high end fashion consumers, high-end fashion and luxury brands have planned to use social media tools to connect with consumers in recent years; however, these social media tools have not become widespread as of yet. According to a recent McKinsey survey, online shopping currently accounts for less than 30% of luxury sales (McKinsey, 2020). Traditionally, mid-to-high-end fashion and luxury brands offer a one-to-one service to consumers when shopping. High-end retail customer experience has become crucial in the experience economy (Pine & Gilmore, 2011). However, with the emergence of online shopping platforms such as mobile phones and tablet computers, consumers are becoming more accustomed to using the online platform for selection and comparison when shopping. Therefore, in order to ensure that the target customers of mid-to-high-end fashion and luxury brands can enjoy unique and high-quality services simultaneously, the establishment of offline and online cooperation has become both a challenge and an opportunity.

This thesis studies the second type of Brun's core values: Sustainable

supply chain management. The supply chain consists of suppliers, producers, manufacturers, distributors, retailers and consumers. The term “supplier” refers specifically to the supplier of raw materials or semi-finished products (Brun, 2017). Secondly, producer refers to the institutional department that designs, manufactures and processes goods. Moreover, the distributor is responsible for the transit of goods to retailer’s transport and distribution hubs. Additionally, retailers connect distributors and consumers, often in department stores, malls and other locations to the end consumer (Brun, 2017). According to Morana (2013), the sustainable supply chain can be approached from three perspectives: environmental, social and cultural, as well as economical. In addition, Gwilt (2014) proposes the fourth perspective: design and service. Therefore, this thesis will summarize the principles and guidelines of sustainable supply chain from four perspectives: environmental perspective, social and cultural perspective, economic perspective and service perspective.

2.1.2 Fashion Visual Merchandising

Visual merchandising is a method to help companies display and sell products to consumers from the visual layer (Davies & Ward, 2015). The physical visual display is the most straightforward language for

communicating with consumers. It determines the consumers first impression of the product and brand image, and also greatly affects whether the customer has a desire to further understand the product. There are various carriers and methods of visual merchandising. At present, most companies use graphic design such as logos, pictures and advertisements, as well as space design such as window displays and store design as the main visual merchandising methods (Kim, 2013). In summary, visual merchandising is the use of creative visual elements to express the core values of corporate brand culture and to convey these contents to consumers to achieve the purpose of improving the brand image and product sales.

Current fashion brands can be divided into four categories based on price and target group, namely, Giffe or designer brands, Luxury brands, Premium brands and mass-market brands (Hameide, 2011). Giffe refers to handmade items, while Luxury brands refer to brands with the following characteristics: high quality, expensiveness, scarcity, aesthetic, heritage or personal history and superfluity (Dubois, Laurent, & Czellar, 2001). In turn, the term Premium brand refers to high-end brands, also known as new luxury goods. Premium brand is further divided into the following three categories (Silverstein & Fiske, 2003): Super-premiums, Old luxury brand extensions, and Masstige. The level of Super-premiums is

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close to the pricing and crowd positioning of traditional luxury brands, which are expensive, and the items are mostly symbols of identity and success. Old luxury brand extensions refer to relatively low-priced brands created by traditional luxury brands. Masstige is a derivative of another traditional luxury brand, whose price can be widely accepted by the public, and the products in the market are high-quality products (Jin & Cedrola, 2017, pp. 1–39). Last but not least, mass-market brand refers to products which are mass produced, have low prices and acceptable quality. In conclusion, this paper plans to do the research on the window displays of mid-to-high end fashion brands which refers to Giffe or designer brand, Luxury brand, and Premium brand, because these three categories of fashion brands have relatively high prices and pay attention to quality, where design can play a certain role in the window display of these brands.

Currently, the retail store is the most commonly used and the most popular brand marketing method of mid-to-high end fashion brands. For the tourists walking through the commercial street, offline retail stores can first attract the attention of customers, and directly affect the impression of customers on the brand, as well as the decision of whether to enter the store. Furthermore, four types of offline retail stores mainly exist today, these include flagship stores, department stores, independent stores, and

boutiques. Flagship store refers to the store with the largest scale and the most representative and complete products in the downtown or regional center. It mainly promotes the brand image and displays the products. In turn, department stores are joint commercial centers with a large number of brands, which are managed separately internally. Each brand has its own counter whereas the independent store is a single retail location only owned by a single brand. Furthermore, boutiques are stores that specialize in small cosmetics and accessories and can be found in large department stores (Bailey, 2016). Nevertheless, they all require strategically planned visual merchandising to give customers a desire to learn more about the brand and enter the store when they come into contact with it regardless of the type of retail outlets under the brand.

The visual merchandising strategy of offline retail stores is crucial, and directly affects the possibility of consumers staying and re-patronizing. Firstly, the factors that profoundly affect consumers include store image design, the overall layout of the store, the choice of lighting, the design of large surface graphics and colors, the sound, props, texture, text, the design of the shop window, and even how garments in stores are ironed (Bailey, 2016; Pegler, 2016). For example, color is not only an important object for window communication of brand connotation, but also the most commonly used visual marketing means in window design,

followed by the use of lines (Pegler & Kong, 2018). Furthermore, the prop is an auxiliary decoration to help display the exhibits and set off the atmosphere in the window (Pillai et al., 2011). In the window design, the props are important objects to show the brand products and brand culture. In addition, a mannequin is the most commonly used prop (Pillai et al., 2011) in the window design of fashion brands, especially in the display of clothes. It suggests that consumers can quickly generate the image of the brand store through these visual objects, and even match the formed image with their own image and identity, so as to quickly judge whether the brand is their target consumer brand. Secondly, with the change of modern lifestyle, shopping malls are not only a place for shopping, but also a place for people to relax and make friends (Crewe, 2016, pp. 511–529). This helps to understand that when people enter the shopping mall, they are not very clear about the purpose of consumption, but they are looking for a comfortable shopping experience. In summary, the visual merchandising of brands should not only clearly express the brand's own characteristic image, but also create a relaxed and enjoyable shopping experience from the perspective of consumers.

The expression and design of the shop window will directly influence the behavior of consumers. Most retail outlets have one thing in

common: they all have windows connected to the outside. In addition, the window display of offline stores is the first place to make visual contact with customers. The window is the “face” of offline stores to convey the spirit of the brand. Through two such facts, the content of the next section will analyze in detail what constitutes visual merchandising in the window.

2.1.3 Window Displays in Visual Merchandising

Different types of brand window displays correspond to different types of visual merchandising. For fashion fast-selling brands, there are generally standardized visual image rules for the windows of their chain stores. For mid-to-high-end fashion brands, the window design has a dedicated design team, with a variety of window types and various themes (Diamond, 2015). This thesis explores the visual merchandising methods of mid-to-high-end fashion brands.

Visual merchandising is an important way to express the concept of window display theme. The internal structure of the window can be divided into color, texture, prop, light, space, etc. (Pegler, 2016; Bailey, 2016). Visual merchandising is the integration of lighting, layout and other elements to enhance the brand image, so visual merchandising is

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an important way to express the theme of the window and communicate with consumers in window design (Morgan, 2011). For consumers, the window is the only visual carrier connecting them to the internal environment of the store, so the information expressed in the window largely determines whether the consumer will enter the store to learn more about the brand and would also directly affect the offline sales.

Theories related to visual merchandising window displays in window design mainly explore the relationship between visual merchandising and consumer behavior. First of all, storytelling scenes will make people more eager to understand the window space. Kaplan proposed that a more coherent and story environment would be easier for people to understand, and a complex environment would encourage people to explore (Kaplan, 1978). According to research, the complex and novel environments stimulate people's desire for exploration (Mehrabian & Russell, 1974; Turley & Milliman, 2000). Secondly, the pleasant environment will make people more willing to enter shops. Donovan, Rossiter and Marcoolyn (1994) introduced the biological response (SOR) model to the study of store atmospheres, proving that the generation of pleasure and arousal emotions will increase people's desire to buy in-store. Based on the above theory, there are also a few studies examining external variables, that is, the influence of window design on consumer

behavior. Studies have shown that consumers' decision whether to enter a store is related to information obtained from window displays, such as promotions, brand image, fashion, etc. (Sen, Block, & Chandran, 2002). In addition, some studies have found that more creative window displays can attract consumers' attention and increase the likelihood of consumers entering the store (Cornelius, Natter, & Faure, 2010).

The author summarizes visual merchandising methods and principles for window displays according to Pegler (2016) as follows:

Color:

Yellow: Yellow is easy to think of things that are full of energy and vitality, such as sunshine and lemons, representing the hope of the world.

Orange: Orange is a warm color that reminds people of a gentle sunset and a soft fire.

Red: On the one hand, red implies excitement, arousal and enthusiasm; on the other hand, red represents stop and forbid. In different countries and cultures, red conveys different meanings.

Pink: The color pink is easy to give a lovely, romantic feeling and is

reminiscent of the flowers that are waiting to be released, the fresh flowers and the beginning of life.

Green: Green represents nature and reflects the freshness and sustainability of nature. At the same time, green also shows health, positive and upward feelings, and bringing new hope to people.

Blue: Blue is reminiscent of vast skies, calm lakes and untouchable ground planes. At the same time, blue will bring people a cool, clean feeling of summer.

Blue-green: Blue-green is a combination of tasteful and bright-eyed colors derived from blue and green. Also, this color is very unique and has a vitality and elegance.

Peach: Peach is a very friendly color and this rich color reveals warm red and yellow, which makes people feel an appetite and a desire to be close.

Purple: Purple is a romantic and mysterious color, which is very attractive to children. People often use this color to create a fantasy world.

Gray: Different shades of gray convey different information. Gray with low brightness is usually used as a matching color or background color for bright colors, giving a feeling of negative, backward, and hidden. In contrast, the high-gloss and lustrous gray gives a noble feeling and can easily become a visual center.

White: White in most cultures is akin to purity and sincerity. The color white can also be used to complement other colors to create a serene and bright atmosphere.

Black: Black represents mystery and complexity. Black is a classic color that will never be outdated. Artists have created countless classics in black, leaving noble and classic works. But on the negative side, black can also represent danger and fear. Black is highly accepted and can appeal to both men and women.

Analogous color: Similar colors used together make the scenario very harmonious, keeping subtle changes in the harmonious scene. Such a way of foiling each other can convey the color itself more carefully and accurately.

Using color to promote color: The accessory of the product can be more

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prominent in the product itself by using the complementary color of the product itself. If the color of the product itself is more elegant, the use of colorful accessories can make the product look richer. If the product itself is sold to the public and is relatively cheap, then such a combination will make the product look more cost-effective.

Complementary colors: The effect of putting the complementary colors together is strong, creating a lively atmosphere and a sense of movement that is very eye-catching.

Contrast colors: The visual effect produced by the contrast color is quite exaggerated, and the strong visual effect is easy to become the visual center of the scene.

Monochrome colors: Monochrome colors are easy to understand and accept, and this kind of color can be a very pure expression of a certain atmosphere.

Neutral Colors: The neutral color can be used very gently as a background for the furnishings, minimizing interference with said furnishings. The neutral color is relatively low-key and has affinity. It is an indispensable auxiliary and foil in the window.

Texture:

Rough texture: Rough texture may symbolize masculinity and roughness, which gives the audience a sense of weight and ruggedness, such as rough wood and iron.

Soft texture: The soft texture exudes the charm of women, representing romance, softness and cuteness. For example, some textures like tulle, velvet and lace.

Neutral texture: The neutral texture can bring people a sense of peace. In the composition, it usually plays the role of unifying the picture and foiling the exhibits, such as blankets, cotton cloth, flannelette and other materials.

Line:

Different line conveys different visual feeling.

e.g. vertical lines: height, dignity, strength;

horizontal lines: width, elegance, tranquility;

curved lines: softness, grace;

diagonal lines: action, force, excitement

Vertical lines: The vertical lines easily remind people of the solemn

pillars of a church or towering trees, conveying a sense of power and distance to people. When the vertical elements become very thin, the elegant feeling can be displayed to the extreme.

Horizontal lines: The horizontally stretched lines are reminiscent of the horizon and express calmness. The horizontal line not only slows down the rhythm of the window, but also relieves the emotions of the customer. The horizontal lines allows the entire window to be more affinitive. Visually, the exhibits can be made wider and shorter.

Curved lines: Curves of different curvatures can express different sensations. Curves with a lot of curvature look very sexy and exude a feminine charm. The flat curve of the curvature exudes a lively and agile temperament. Curves can be reminiscent of shapes in nature, such as raging waves, majestic peaks, and rolling seas. Curves can subtly create the rhythm of the scene as well as the center of the vision.

Diagonal lines: The diagonal lines give the overall display a sense of movement, making the picture full of rhythm and vitality. In addition, diagonal lines make the original static picture look full of power and energy. Furthermore, most people associate diagonal lines with moving objects such as storms, contrails, meteors and so on.

Composition:

Composition first helps to show the consumers the whole display through some shapes and patterns created by props, and then bring their attention to each part around the window display, which is called “visual follow through”.

Balance: Balance is very important in a picture that is displayed, and the balanced design gives the consumer a harmonious visual and aesthetic impression. In a display, it is vital to make each small piece of the picture have similar prominence. Asymmetric balance brings unexpected vitality to the picture. Different objects will produce different visual weights through different colors and shapes. Placing these objects together neatly to create a harmonious image can influence the customer. For instance, large areas of white and linear or point-like dark colors may also form an asymmetrical visual balance.

Dominance: It is important to highlight an object in a picture. The consumer’s visual attention is very short, which makes it critical to efficiently deliver information in a shortest possible time. There are many ways to make an object stand out, such as using a color with high purity, or using repetition and superposition to create a sense of hierarchy.

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Contrast: Contrast can further distinguish the difference between the element, and further highlights the characteristics of the element itself. There are many ways to display contrast, such as between darker and brighter colors, soft and resolute lines, and the contrast between fine and rough textures.

Rhythm: Rhythm, as an important visual marketing method, can lead customers to notice every detail in the window (Abarajithan, 2013). Good picture rhythm will make the elements in the display process more coherent, readable and narrative. The audience will perceive the central point expressed in the window as they read. Sometimes, the model in the window is not the focus but plays an auxiliary role. However, the model is large and easy to draw the attention of consumers. A good picture rhythm will make customers stay on the model for a short period, the eyes will be naturally directed to the displayed clothes or accessories.

Lighting:

A spotlight can carry a customer's eyes to the product.

e.g. strong light pattern

Material:

Metal: Metals are highly malleable and can be extruded or cut to create a variety of shapes of pipes, shelves, and rails, and can produce a variety of combinations for efficient modular splicing. Smooth metal can give a noble and elegant visual experience. Rough and even rusted metal can create rough and ridiculous scenes.

Plastic: Plastics are highly malleable, including transparent, opaque, translucent plastics, as well as plastic sheets and plastic films. In addition, the color and size are customizable. Furthermore, plastic has good waterproof performance and strong durability.

Styrene: Styrene can be widely used in the outer casing of products and props, and can be subjected to a series of machining and thermoforming.

Foam: The foam is easy to paint and shape, and the props made of foam are small in quantity and easy to handle. The foam material can be shaped like a white foam and can also be randomly shaped between two solids. It is easy to be colored after drying.

ABS: ABS plastic has an attractive appearance with good flexibility. It is commonly used for the base of display devices. ABS plastic is also inexpensive.

Acrylic: Acrylic has similar features as glass, but is much lighter with superior qualities. Acrylic can be mechanically cut and polished.

Resin: Resin is a liquid plastic that can be made into a complex shape or model that is visually attractive to the consumer.

Texture Plus: Texture Plus uses high-density molded polymer to mimic the texture of other materials, which makes it easier to replace materials and adapt to the environment.

Paper and boards: Paper and boards can be easily bent into a variety of shapes to create a variety of structures. Paper and boards are very malleable, easy to stick and make stable structures.

Proportion:

Unusual or surreal proportion can give consumers a sense of freshness. For example, highlight and enlarge the goods displayed by reducing the proportions of models.

Contrast:

Contrast can make the scenario special. Contrast is achieved by lights or colors with strong contrast and unusual proportions.

Repetition:

Repetition refers to the use of the same display props or models many times, which can attract the attention of visitors quickly and for a longer time. For example, in the background of the exhibition, repeated and successively superimposed figures are used to create the sense of movement generated by the model and give the window a sense of depth.

Humor:

Humor can better and quickly mobilize relaxed and happy moods of people. In a happy mood, customers are more likely to be attracted by the window display and enter the store.
e.g. “dad-doll” window displays

Nostalgia:

Nostalgia can evoke fond memories of a certain historical period, as well as the desire to learn more about it.

Motion:

The moving window easily stands out compared to static ones, making consumers want to stop and explore to enjoy the fun.

Surprise:

Surprise refers to the scenes that are not commonly seen in daily life, but can captivate customers. Such science includes science fiction, magic and surreal scenes. In addition, surprise can invoke a topic in daily conversation of people, leaving a lasting memory from such window designs.

Shock:

Shock means to deliberately startle customers to capture attention and create buzz. At the same time, it needs to uphold values which will rather bring in more customers than scare them off. An example is an unexpected surreal scene.

Fantasy:

Fantasy refers to the description of some absurd or artistic stories, which may be inspired by fairy tales, science fiction and other literary works. When viewers see these works, feel as if they are temporarily withdrawing from real life and entering another wonderful world.

Surrealism:

Surrealism uses elements of works of surrealist artists such as Dali to again create fantasy scenes outside the reality again.

2.2 Sustainability in Fashion Supply Chain

This section concentrates on the concept of the sustainable fashion supply chain. First, the basic steps involved in the fashion supply chain, and the current problems in the fashion supply chain are explained. Then, the importance for fashion brands to deliver the information about their sustainable supply chain from their websites to their customers through their window displays is illustrated. Finally, the current perspectives and principles of sustainability in the fashion supply chain are summarized.

At present, the problem of low social transparency in the fashion supply chain is widely recognized. The fashion supply chain mainly includes design and development, raw material procurement, processing production and distribution retail. The fashion supply chain of a fashion brand is not a simple and easily controlled process and is often affected by many factors. For example, multiple stakeholders such as manufacturers and sellers. If problems occur in the links of the supply chain, such as environmental pollution caused by the acquisition of raw materials, the reputation of the company and the brand will be seriously affected (Svensson, 2009). Therefore, there are many uncontrollable factors in the supply chain of fashion brands, leading to high difficulty in

supervision and low transparency of information to the public.

The openness and transparency of the fashion brand's fashion supply chain is very important in establishing a close relationship with consumers. With the increasing attention of consumers to the environment and the sustainable development of society, consumers tend to buy products with green protection concepts (Wang, 2014). The transparency of the fashion supply chain of fashion brands can make consumers more clearly understand the whole process of the brand from design, production and processing, which can not only facilitate consumers ability to choose and find sustainable products, but also supervise the brand to assume the responsibility for the sustainable development of the environment and society (Boztepe, 2012; Schlegelmilch, Bohlen, & Diamantopoulos, 1996). Furthermore, the sustainable brand hopes that consumers can pay attention to the details of the brand's products in their window displays, for example, focusing on the brand's environmentally friendly fabrics and textures (Yan & Yazdanifard, 2014). Because customers are more likely to obtain information related to product composition, such as fabrics and materials (Ha & Lennon, 2010).

It is crucial to communicate the sustainability efforts of the fashion supply chain to the consumers. Consumers could then understand the

sustainable impact of product production on the environment and society, which will make consumers more responsible in purchasing behaviors and give consumers the right to supervise (Joshi & Rahman, 2015). Such a power shift could have a positive impact on both the business and the fashion industry as a whole. (Gen, Juan, & Xixiang, 2019).

Moran (2013) puts forward that the sustainable supply chain of fashion brands is composed of three levels: 1) the environmental level, 2) the economic level, 3) the cultural and social level. Building on Moran's (2013) model, Gwilt (2014) proposed the fourth level: 4) the consumer service level. These approaches include altogether 25 principles of sustainability for fashion supply chain. Principles 1-18 are summarized by author according to Moran (2013), and principles 19-25 are analyzed by author according to Gwilt (2014).

- **1) Environmental level (Moran, 2013):**

From the perspective of environment, the sustainable performance of the company in the supply chain can be divided into the following three approaches: Green design for eco-design, Green operations and Green transport (Moran, 2013).

Green design for eco-design consists of two parts. First, reduce the

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waste of materials in the production process (Principle 1), and begin to rationally plan the use of raw materials at the design stage so as to reduce the pollution of the environment and humans (Principle 2), or use scientific and technological means to extend the life of materials (Principle 3). Second, in the end-of-life phase, the recycling rate of waste materials is raised to the highest. Therefore, it is essential to reduce the amount of energy sales, and rationally plan the energy to be used in product production and material transportation. (Principle 4).

Green operations focus on green manufacturing and re-manufacturing as well as Innovation in waste management. On the one hand, Green manufacturing and re-manufacturing mainly focused on the reuse of materials involved in the production process and the management of inventory. Inventory management includes forecasting, planning, and execution of material usage, as well as the time, quantity, and shipping method of the order. From each of these steps, maximum material utilization should be considered (Principle 5). On the other hand, Innovation in waste management means that the company organizes activities to involve consumers in the recycling process. Such campaigns can raise consumer awareness of recycling (Principle 6).

Green transport refers to a company's choice of green and low-carbon

means for material transport and transportation. Environmental pollution should be minimized during transportation (Principle 7).

- **2) Economic level (Moran, 2013):**

The economic level means the perspective of how to be profitable as fashion producers. From an economic perspective, there are three aspects: Upstream logistics strategy, Management strategy of transport of logistics providers as well as Distribution logistics strategy (Moran, 2013).

In upstream strategic logistics, upstream logistics refers to the supplier, while upstream logistics refers to the development of a good relationship between suppliers and customers (Principle 8).

From the perspective of strategic management of transport, it refers to the coordination between transport modes. According to the advantages and disadvantages of different modes of transportation, for example, air transport is fast but small in volume, the reasonable combination and coordination among different modes of transportation are required to maximize economic benefits (Principle 9).

From the perspective of Distribution strategic logistics, it refers to changing distribution method from e-commerce to u-commerce. From

e-shopping and e-commerce to ubiquitous trade. Specifically, shopping from the computer becomes shopping from a mobile phone, a tablet device, or even a social device. At the same time, consumers have changed from regular shopping to shopping anytime, anywhere (Principle 10).

- **3) Cultural and social level (Moran, 2013):**

From a cultural and social perspective, the sustainability of the company is reflected in four aspects. First, respect the individual rights of employees of the company, such as the right to rest and have vacations, and the right to receive remuneration for work (Principle 11). Second, organizational commitment. It means employees recognize the core values of their company and have loyalty and trust in their organization. Commitment of employees to staying in the company due to long-term loyalty to the company (Principle 12). Third, the sense of pleasure that employees feel at work (Principle 13). The pleasure employees get from their work will build up their sense of identity for doing the job and helps to build confidence in the long-term ongoing work. Fourth, establish the identity and image of the organization. A good corporate image will give employees a sense of belonging. (Principle 14).

From an external human resources, cultural and social perspective, there are three factors which aid in achieving sustainability. For the company,

it helps establish and enhance the company's attractiveness, and provide employees with the opportunity and benefits of learning skills (Principle 15). Also, establishing a good image for a company enhances its credibility. Corporate image refers to the image established by the public in the industry (Principle 16). Another important factor is the support from outside organizations and partners such as the trade unions for the benefit of employees and workers (Principle 17). In addition, the establishment of social and environmental benefits of institutions, such as supervision of the company's carbon dioxide emissions exceed the limit play a vital role (Principle 18).

- **4) Consumer Service level (Gwilt, 2014):**

Consumer service level can be approached from the design, production, distribution, and use perspectives.

Design should understand the audience's habits of use in order to fulfil the actual needs and desires (Principle 19). When designing products, emotional engagement is considered an added value, resulting in product use longevity (Gwilt, 2014) (Principle 20).

The understanding of durable design (Principle 21) varies because durability is understood differently among people. For some, durability

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is related to the emotional attachment, creative design or an attractive story, while for others, expensive material and good quality symbolizes durability (Gwilt, 2014).

In distribution, the needs and desires of the consumers can be tackled through customization services (Principle 22) online or offline. Some fashion brands have established online consumer communities where consumers can directly establish contacts with merchants and participate in the design (Principle 23).

Brands can have an impact on how the products are used and maintained. Appropriate cleaning, repairing, storage, recycling and other forms of care for garments extend the life of products (Principle 24). Furthermore, technology can be utilized in developing new ways to extend the life of old materials and turn them into new materials (Principle 25). Recyclability can be taken into consideration during the

initial stages of product design (Gwilt, 2014).

Table 1. 25 Principles of sustainability of fashion supply chain

Environment perspective (Moran, 2013)	Sustainable eco-design	1. Waste reduction in the material production, processing, transportation and end-of-life phase 2. Pollution reduction to environment and human 3. Extending the life of material by technology in the material production, processing, transportation and end-of-life phase 4. Recyclability of material in production and end-products
	Green operation	5. Maximum the use of materials in inventory management 6. Innovative waste management by involving consumers
	Green transport	7. Low-carbon transportation
Economic perspective (Moran, 2013)	Upstream logistics strategy	8. Good relationship between suppliers and companies that use suppliers
	Management strategy of transport of logistics providers	9. Coordination between transport modes to maximize economic benefits
	Distribution logistics strategy	10. Changing shopping mode from electronic commerce to ubiquitous commerce

Cultural and social perspective (Moran, 2013)	Internal human perspective	11. Respect for the individual rights of employees of the company 12. Commitment of employees to staying in the company due to long-term loyalty to the company 13. The sense of pleasure that employees feel at work 14. Establish the identity and image of the organization
	External human resources	15. Provide employees with the opportunity and benefits of learning skills 16. Establish a good and socially oriented image 17. Trade unions for the benefit of employees and workers 18. Establishment of social and environmental benefits of institutions and people in society
Economic perspective (Moran, 2013)	Design	19. Collecting information of consumer's habits of using and dealing with commodities for design 20. Adding emotional added value to arouse people's resonance in order to extend the service life of fashion products
	Production	21. Improving durability of products by adding strong emotional resonance and enhancing quality
	Distribution	22. Customized products according to the needs of consumers to provide consumers with personalized customized services. 23. Consumers can directly establish contacts with merchants and participate in the design of products
	Use	24. Paying attention to the use mode of goods of consumers 25. Develop targeted material repair technology for consumers

2.3 Semiotics in Visual Merchandising

Subchapter 2.2 has discussed the importance of sustainable supply chain information in the window display of fashion brands and the importance of visual merchandising to the theme of window design. Semiotics provide an analysis method to explore how window display communicates the concepts and values of the fashion brands through visual merchandising. This chapter explains the rationale of semiotic analysis in window design and the current semiotic theory used in design.

2.3.1 Semiotics Used in Window Display

Semiotics focuses on the meaning of communication content (Lemonnier, 2016; Barthes, 1968). The semiotic analysis model first appeared in the field of language communication to analyze the underlying meaning of language (Saussure, 1959). Ferdinand de Saussure is the

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founder of the theory of linguistic semiotics. He focuses on the study of symbols and how symbols convey meaning in communication, and he presented that is no specific connection between signifier and signified in the language system (Saussure, 1959, p. 67-70). Saussure proposed that the sign is composed of two parts: signifier and signified (Saussure, 1959). The signifier refers to the sound image of things in Saussure's linguistics, and the signifier refers to the concept and meaning behind this sound image (Saussure, 1959, p. 67-70). For example, the signifier of a red light in a traffic signal is a pattern of "red circles" that directly acts on the senses, while the red light refers to the conceptual meaning of the red light in the context of traffic, which means stop.

Semiology is based on the development of linguistic communication and was later applied to the analysis of the meaning of visual elements. Roland Barthes (1968) applied semiotics to the analysis of visual elements for the first time. Specifically, he believed that fashion can be regarded as a symbol of expression. Roland Barthes analyzed the visual elements in clothing as a visual language, transmitting information to others and the world (Barthes, 2013). Roland Barthes developed a semiology further to include a relationship between Signifier and Signified in Sign (Shepperson, 1993; Barthes, 1968).

Chandler (2007) expanded the diversity of symbols. Specifically, pictures, smells, props, and such elements that appear in life can be regarded as symbols. Humans are the creators of these symbolic meanings. According to the above theory, design objects and designed spaces – such as window displays – can also be regarded as symbols. The signifiers of these design symbols are the components of these items, such as color, materials and props, and the signified refer to functions, cultural connotations, and theme concepts (Ye, 2016).

Store windows can be regarded as one of the very important symbols in the fashion brand space, and the semiotic method is therefore reasonable to analyze how the visual elements (signifier) in the window express their theme (signified).

2.3.2 Semiotics Used in Design

At present, the application of semiotic analysis in design is mainly concentrated in the field of graphic design and product design. In the field of graphic design, semiotic analysis mainly focuses on two aspects. The first is to analyze the relationship between visual symbols and brand culture, the second is to analyze the social significance of visual symbols. Specifically, on the one hand, semiotics has analyzed the relationship

between visual symbols and brand concept communication (Thurlow & Aiello, 2007), and how visual symbols can help brands create effective brand personalities (Bevins, 2014). On the other hand, semiotics analyzes the social meanings established between people and objects depicted in two-dimensional images (Van & Jewit, 2001; Kindborg & McGee, 2007; Page, 2006). In the field of product design, relevant literature has studied the relationship between semiotics and product design (Figueiredo & Coelho, 2010). There are also studies on the use of semiotic analysis to interpret the relationship between the internal components of the product in the product design and the relationship between the product and the user and the use environment (Opprud, 2004; Vihma, 1995; Mattozzi, 2007). For example, Mattozzi Alvise elaborated the process of analyzing the form, function and meaning of a product by a semiotic model (Mattozzi, 2007). Mattozzi's semiotic analysis model not only analyzes the relationship between various components within the product, but also the relationship between the product and the surrounding environment and users (Mattozzi, 2007). By analyzing these relationships, it is possible to further derive the way behind the product and the relationship with the environment and users, such as functional connection and emotional connection (Markussen, 2010). Thus, in product design analysis, the semiotic model focuses on the relationship between product components (signifiers) and functions (signified).

The analysis of semiotics on fashion visual merchandising mainly focuses on the fashion graphic design field, which is mainly divided into clothing pattern research, fashion advertising image research and visual marketing method research. First, a semiotic analysis method has been used to study the cultural significance contained in patterns in clothing (Rachman, Hamiru, Umanailo, Yulismayanti & Harziko, 2019; Morgado, 1993; Taylor, 1998). Second, semiotic analysis is also applied in the communication connotation of fashion advertising, mainly analyzing the symbolic meaning of fashion advertising images (Rhodes & Zuloago, 2003; Almeida, 2009; Kretz, 2010). Thirdly, a few articles used semiotics to analyze fashion visual marketing methods and visual communication methods as well as applied the semiotic analysis framework of Kress and van Leeuwen's (2006) theory (Danish & Kousar, 2017; Ye, 2016).

At present, a small number of literatures use semiotic analysis to analyze the communication of information in marketing. For example, the semiotic method is used to study the sustainable cultural connotation of high-end fashion brands (Cervellon, 2013). Moreover, Hürmeriç (2015) studied the communication mode of sustainable information in corporate advertisements of fashion brands. In addition, Ye (2016) has analyzed how the fashion brand Windows express corporate image from

the perspective of semiotics. Furthermore, a study analyzes the relationship between the dissemination of cultural sustainability and Visual Environment (Ma, 2008).

In summary, several scholars have applied semiotics to analyze graphic design and product design, but only a few in the field of fashion spatial design, such as window display. Specifically, semiotic analysis has not yet been applied to analyze the relationship between the visual system of the window (signifier) and the theme of the window (signified). In addition, the current semiotic analysis related to brand sustainability mainly analyzes the sustainability of the communication of brand cultural significance, and the lack of discussion on the information of the sustainable supply chain.

2.4 Model of Semiotic Analysis

Saussure proposed that there is no specific connection between signifier and signified in the language system (Saussure, 1959, p. 67-70). Roland Barthes inherited the theory of signifier and signified from Saussure and applied it to the field of fashion vision. But he did not insist to the relationship of signifier and signified is arbitrary, he referred to the signified is divided into two levels, respectively, denotative signified and

connotative signified (Chandler, 1994). Denotative signified means that the interpretation of visual information is not affected by the cultural background and space-time of the audience. Connotative signified is associated with individual ability and the understanding of ideology, also affected by the visual information of environment and context (Chandler, 1994). In addition, the Denotative signified refers to the representative level of the visual information (Chandler, 1994). Since window display mainly transfer information of image through visual merchandising (Pegler, 2016). Furthermore, visual merchandising method is a conventional and objective visual tool as well as technique that can help fashion retailers to express brand images (Chaudhary & Shah, 2020). Therefore, corresponding to the semiotic model of the window display system, the signifier is the object in the window, including color, texture, prop, light, space, etc. Denotative signified can be understood as visual merchandising methods, such as material, proportion, repetition, fantasy and so on. Connotative signified refers to the information of meaning level, so in window display, it can be interpreted as the theme and concept expressed by visual patterns. In this study, it refers to sustainability in fashion supply chain in their websites. In addition, the “Sustainability in Fashion Supply Chain Reflected in Windows” (Principle1-25) in the table is used to classify the sustainability in fashion supply chain in their websites collected from brand websites for the analysis below.

The proposed semiotic analysis model (Table 2) builds on the semiotic model by Roland Barthes (Chandler, 1994). Barthes's semiotic model includes signifier, denotative Signified and connotative signified (Chandler, 1994). Specifically, the signifier is the object in the window, including color, texture, prop, light, space, text, light and so on. These objects will be analyzed by author in findings according to the images of window displays. Denotative Signified refers to which design methods are used to express the window theme. In the earlier literature review, the author summarized the most commonly used and most representative new visual merchandising methods according to the theories of Pegler (2016) and will be selected by author to analyze the window. In the earlier subchapter 2.1.3, the visual merchandising methods have been introduced profoundly, such as line, rhythm, proportion, repetition and so on. Connotative Signified refers to the window theme expressed by

objects in the context of sustainable supply chain. For example, the brand BOTTLETOP presents the window theme of people around the world that the brand has empowered through the object of Russian doll. In addition, the "Sustainability in Fashion Supply Chain reflects in Windows" presents that how Signifier (the object), Denotative Signified (design method) and Connotative Signified (the window display theme) are matched with Sustainability in Fashion Supply Chain (25 principles). These 25 principles were summarized by the author according to the theories of Moran (2013) and Gwilt (2014), so as to make the following part more clear and in-depth analysis.

Table 2. Model of Semiotic Analysis

Signifier	Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object	First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Color			
Texture			
Prop			
Light			
Space			
...			

3 DATA AND METHODS

3 DATA AND METHODS



This chapter discusses the data collected by author and the method of this research. Subchapter 3.1 states the data collection, followed by subchapter 3.2 elaborating on the method.

3.1 Data Collection

This subchapter presents the data that is chosen and collected by the author for this study.

Seven mid-to-high-end fashion brands are selected for the semiotic analysis of their window displays. The brands are selected on the basis of their statements regarding the sustainability in their fashion supply chain, available on their official websites. Each of the selected brands has at least one window that aims to communicate their sustainability efforts. The brands provided photos of their window displays on their official websites. These photos are the research material that the author collected for the analysis in this study. The brands and the research material are listed in Table 3.

Table 3. List of fashion window displays

The Fashion Brands	Sustainable window display pictures
BOTTLE TOP (Figure 2)	
Katie Jones (Figure 4)	

Tengri
(Figure 6)



TORTOISE
(Figure 10)



VYAYAMA
(Figure 8)



Deadwood
(Figure 12)



LE KILT
(Figure 14)

The author identified the sustainability efforts in the fashion supply chain of the brands from their websites, and classified the information according to the 25 principles of sustainability of fashion supply chain summarized in section 2.2, as shown in table 4. Sustainability in fashion supply chain as presented on the brand websites is elaborated further in the findings of this thesis (Chapter 4).

Table 4. List of Sustainability in Fashion Supply Chain Mentioned in Websites

The Fashion Brands	Sustainability in Fashion Supply Chain Mentioned in Websites
BOTTLETOP (Figure 1)	principle 4, material recyclability principle 7, low-carbon transportation principle 18, establish social benefits for people principle 21, enhance product durability by adding emotional value
Katie Jones (Figure 3)	principle 1, waste reduction in end-of-life phase principle 4, material recyclability principle 21, enhance product durability by adding emotional value
Tengri (Figure 5)	principle 2, reduce pollution principle 3, enhance material longevity by technology
VYAYAMA (Figure 7)	principle 2, reduce pollution to environment principle 2, reduce pollution to human principle 7, low-carbon transportation principle 11, respect rights of employees
TORTOISE (Figure 9)	principle 3, enhance material longevity by technology principle 21, enhance product durability by adding emotional value
Deadwood (Figure 11)	principle 4, material recyclability principle 21, enhance product durability by adding emotional value
LE KILT (Figure 13)	principle 18, establish social benefits for people principle 21, enhance product durability by adding emotional value

3.2 Methods

This study uses semiotic analysis as a research method to analyze the communication of sustainability applied in the fashion supply chain, reflected in the brick-and-mortar store windows of fashion brands. The subchapter 2.4 has summarized and discussed the specific research framework. This chapter will further explain the feasibility of “Model of Semiotic Analysis” in window analysis.

According to Roland Barthes’ semiotic theory, Signifier means the pure image concept of an object (Chandler, 1994). The denotative signified refers to the representative level of the visual information and it stands for the interpretation of visual information that is not affected by the cultural background and space-time of the audience (Chandler, 1994). Connotative signified is associated with individual ability and the understanding of ideology, also affected by the visual information of environment and context (Chandler, 1994). Since the window design expresses the theme of the window through visual merchandising of the visual elements in the window, the method of visual merchandising determines the relationship between the visual elements inside the window and the theme of the window (Morgan, 2011). Moreover, visual merchandising method is an objective visual tool as well as a

technique that can help fashion retailers to express brand images (Chaudhary & Shah, 2020). From the above, it can be concluded that in the design of the window, the signifier manifests in visual elements such as color, texture, prop, light, and space (Pegler & Bliss, 2006), whereas the connotative signified corresponds with the window theme and the underlying sustainability principles. Denotative signified can be identified in the visual merchandising methods. This corresponding logic is applied as a framework to analyze how the mid-to-high-end fashion brands express the sustainability in fashion supply chain in their websites, through their windows through visual merchandising. This research, thus, analyzes the selected seven windows by using Barthean semiotic model, including the signifier, denotative signified and connotative signified.

4 FINDINGS

4 FINDINGS

This chapter presents the findings according to the “Model of Semiotic Analysis”, introduced in subchapter 2.4. This chapter initially sorts out the embodiment of sustainability in the fashion supply chain of selected brands, and classifies it according to the 25 principles summarized in subchapter 2.2. Secondly, using the “Semiotic Analysis Model”, this chapter analyzes the windows of seven fashion brands from four perspectives, drawn from Barthean semiotic model and the visual merchandising literature: visual object, visual merchandising method, design concept and sustainability in fashion supply chain from websites reflected in windows.

4.1 BOTTLETOP Window Semiotic Analysis



We launched BOTTLETOP with a mission to empower people and planet through sustainable design and creative culture. We began with handbags made from upcycled bottle tops in Kenya lined with leather offcuts. Through a collaboration with Mulberry they became international best sellers, supporting artisans and funding health education for young people in Africa.

We then discovered the beauty and versatility of upcycled metal ring pulls, and developed our signature chain mail fabric that makes up the BOTTLETOP DNA of today. We now have our own atelier and training programs in Brazil and Nepal and continue to source the finest sustainable and upcycled materials in challenged parts of the world.



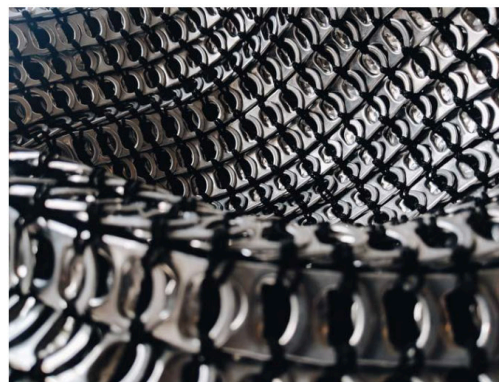
Zero Deforestation Leather

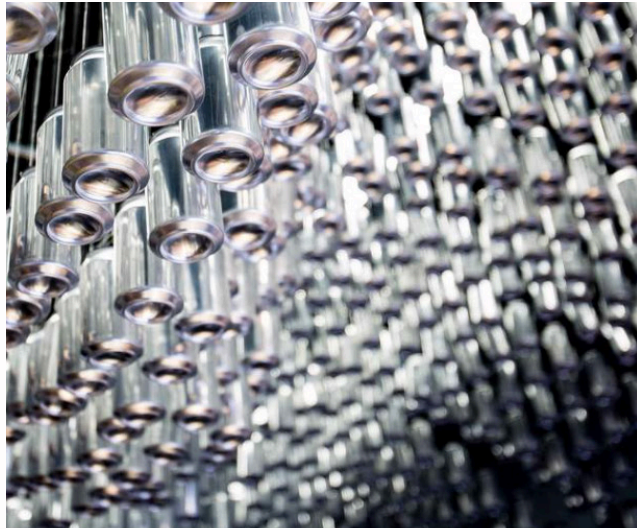
We work with the Instituto Centro De Vida (ICV) to source our leather from a groundbreaking program called Novo Campo. It promotes sustainable farming practices which reduces deforestation and aids rainforest conservation.



Upcycled Ringpulls

All of our bags incorporate upcycled metal ring pulls in their design, which we source and clean in Brazil. We use them to create our signature chain mail fabric





Our Upcycled Store

We're proud to be able to say that in 2017, we opened the world's first ever 3D printed store, made from upcycled ocean plastic. You can find us on Regent Street in London.



Plastic-free Packaging

We are acutely aware of the plastic pollution problem, which is why we don't use any when we ship your bag to you. Instead, it will arrive in recycled cardboard packaging.

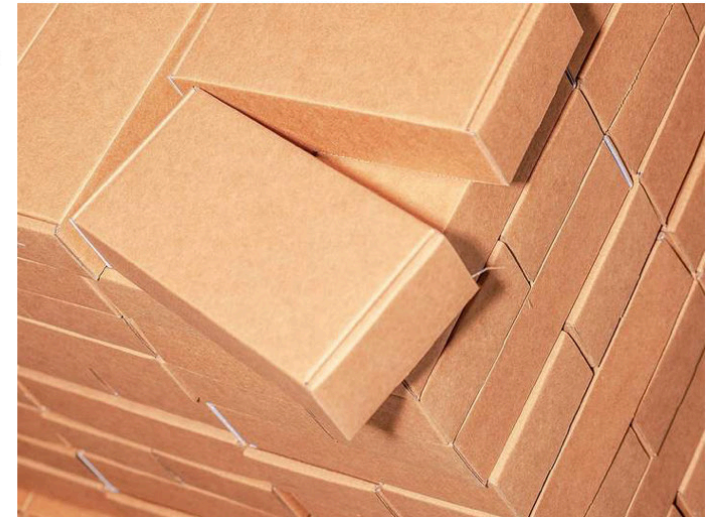


Figure 1: Sustainability in fashion supply chain information from the website of BOTTLETOP (screenshots). Retrieved July 14, 2019 from <https://bottletop.org/pages/our-story>

According to the information from website of BOTTLETOP (Figure 1), the company claims that they initiate and undertake to empower human beings and build a social culture of creative and sustainable design. The company mainly uses three kinds of materials for production and processing. One of their sources of material is recycled bottle top, which comes from Kenya. And another one is leather off-cuts. The third one is metal ring pulls, which is also the DNA of this brand. Both of these materials are waste materials (principle 4, material recyclability). The designers of this company continue the life cycle and use cycle of materials in products through creative and emotional design (principle 21, enhance product durability by adding emotional value). Moreover, also from the environmental perspective, the brand claims in the website that they use recycled cardboard packaging to ship the bag, which is company's choice of low-carbon ways for transportation (principle 7, low-carbon

transportation). From the social and cultural perspective, this company not only supports the growth of young artists, but also raises money for the education of children in Africa. Furthermore, they have set up training workshops in Brazil and Nepal to get more people involved in the use of sustainable materials, which meets the principle 16, which is establishment of benefits of people (principle 18, establish social benefits for people). Therefore, Company BOTTLETOP pursues sustainability according to characteristics 4, 7, 18 and 21.



Figure 2: Window display of BOTTLETOP. Retrieved January 6, 2019 from <https://justinfocus-technicaldesign.work/projects/selfridges-sustainability>

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The signifier is white, the denotative signified is color as a merchandising method, and the connotative signified in the context of sustainable supply chain, presented in the brand website as the affinity of empowering people. Specifically, the Russian dolls in this window are all in white. White is a symbol of purity, which might express a pure atmosphere and make the whole atmosphere bright and translucent, and it is also an auxiliary background for the main display items.

The signifier is the Russian doll, the denotative signified is fantasy, and the connotative signified in the context of sustainable supply chain, outlined on their website, represents people around the world that the BOTTLETOP brand has empowered. To be specific, “Russian dolls” are used to echo the text ‘The Human Face of Fashion’ on the window. Fantasy stands for metaphor and imagination (Pegler, 2016). Through the fantasy design method, Russian dolls represents the people that brand has helped and empowered all over the world since 2002.

When the signifier is the Russian doll, the denotative signified is the line, and the connotative signified in the context of sustainable supply chain, presented on their website, is communicating human and socially friendly behavior. The Russian dolls props have a repeating pattern that creates a wavy curve, which gives people a soft and elegant feeling (Pegler, 2016). In this way, the “human and socially responsible

behavior” is communicated in a more contagious and expressive way.

The signifier is Russian dolls placement, the denotative signified is the rhythm, and the connotative signified in the context of sustainable supply chain is the “range of people that brands help has spread all over the world”. From the spatial perspective, The Russian dolls in the shop window are placed at the left, right and to the rear of the shop window. Through a special placement method, the rhythm of the wave is visually generated. Such a sense of rhythm helps to express readability and narrative (Pegler, 2016). Finally, one of the signifiers is the text “THE HUMAN FACE OF FASHION”. Through the meaning of the text as reflected on the official website content, the connotative signified of the text represents people who have been helped by this fashion business.

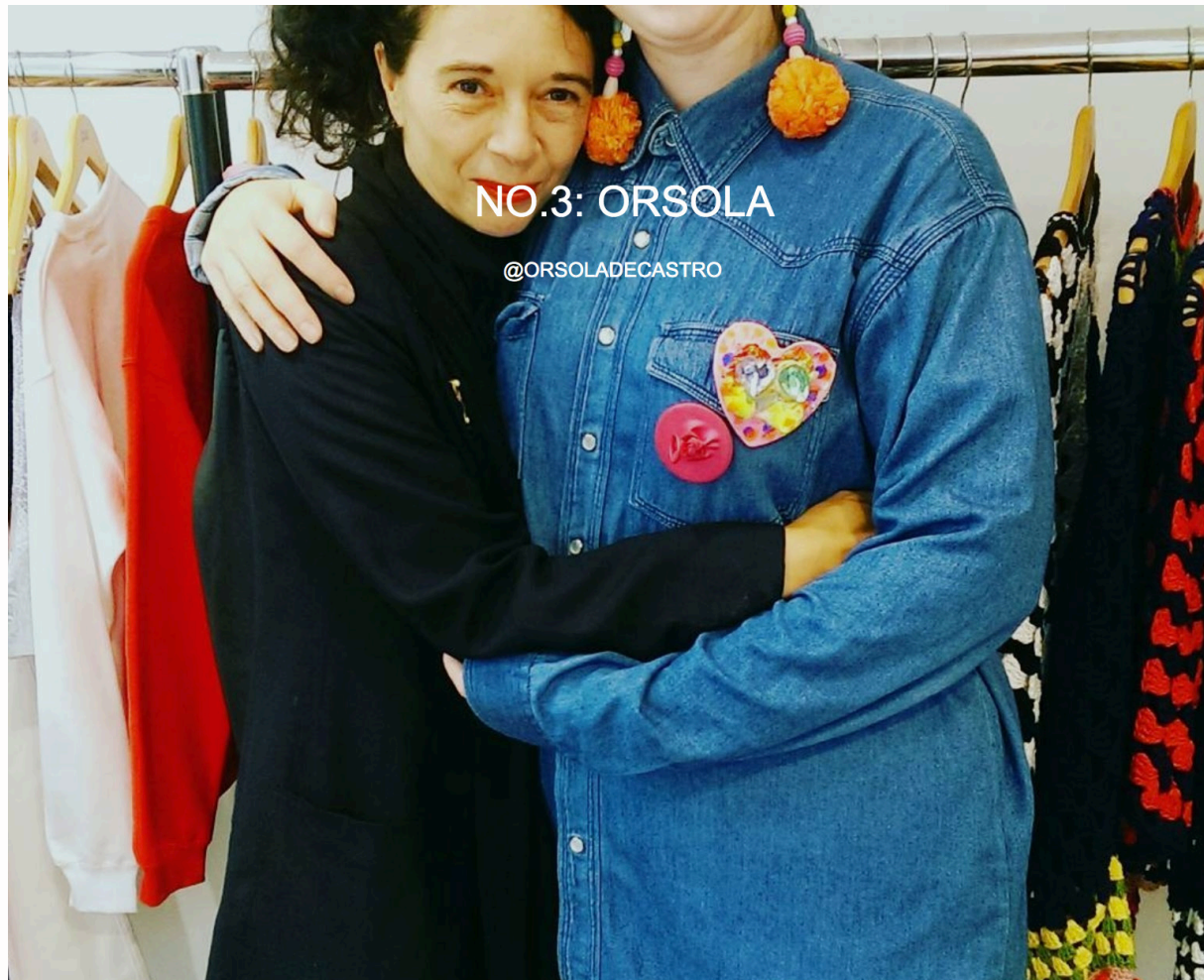
In conclusion, listing in Table 5, the Sign of “Window of BOTTLETOP” uses Russian doll props to represent people around the world that the BOTTLETOP brand has helped and empowered since 2002. They communicate this sustainability principle through fantasy, color, rhythm and lines through visual merchandising methods. Expressing the brand’s social and cultural sustainability efforts: the company website claims that it has helped many people by providing employment and education opportunities. Therefore, the BOTTLETOP window display only reflects

the sustainable principle 18, but does not represent the sustainable principle 4, 7 and 21, mentioned in their website.

Table 5. Model of Semiotic Analysis of BOTTLETOP Window Display

Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
color	White	Color: pure and innocent	the affinity of empowering people	principle 18, establish social benefits for people
Prop	Russian dolls	Fantasy	Representing people around the world that the BOTTLETOP brand has helped and empowered since 2002.	principle 18, establish social benefits for people
		Line	Communicating "human and socially friendly behavior"	principle 18, establish social benefits for people
Space	Russian dolls Placement	Rhythm	The range of people that brands help has spread all over the world	principle 18, establish social benefits for people
Text	"THE HUMAN FACE OF FASHION"	Text	The people who have been helped by the fashion brand business	principle 18, establish social benefits for people

4.2 Katie Jones Window Semiotic Analysis



Clare is my Woolly Wonder Woman and family owns a Knit Factory in Leicester! I found Clare by accident and without her I wouldn't have been able to upscale my production. Thanks to her it meant we could produce larger numbers and work with amazing stores such as Selfridges!

Their factory produces aran sweaters using British Wool and we have been able to use there waste on so many fun projects, such as our knitted cow for Kids Hackney, Bouf.com Window display and our charity Giant socks for HUBBUB!

Figure 3: Sustainability in fashion supply chain information from the website of Katie Jones (screenshot). Retrieved July 14, 2019 from <http://www.katiejonesknit.co.uk/blog/2018/2/21/n6lidxx9b50j56ehw7iv3cngs1tcur?rq=sustainable>

Katie Jones explained on her official website (Figure 3) that in the process of working with British wool materials dealers. They reused excess and waste materials in creative ways (principle 21, enhance product durability by adding emotional value). For example, they used waste materials, including crochet, pom-pom, and yarn, to create colorful and creative window designs. The Katie Jones brand is committed to researching and utilizing sustainable textile fabrics in the selection and production of apparel fabrics. On the one hand, the brand follows a reduction in the waste of raw materials and uses creative and sustainable ways to make beautiful window displays from discarded raw materials (principle 1, waste reduction in end-of-life phase). On the other hand, the brand is looking for sustainable raw material suppliers and insists on using sustainable raw materials for design (principle 4, material recyclability). Both aspects meet the guidelines of reducing raw material waste. In summary,

the Company Katie Jones pursues sustainability “according to characteristics of 1, 4 and 21.



Figure 4: Window display of Katie Jones. Retrieved January 6, 2019 from <https://www.cathyvanhear.com/katie-jones-x-bouf>

The signifier is the color composition of red, green, orange and blue, the denotative signified of which is color and contrast between colors, and the connotative signified in the context of sustainable supply chain drawn from the website is making materials look more lively and vibrant. The windows use brighter colors and contrasting colors such as red and green. Exaggerated contrasts

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show a strong visual effect, making it easy to create a central scene, so that consumers pay more attention to the material itself.

The signifier is fabric, the denotative signified is the lexical meaning, and the connotative signified in the context of sustainable supply chain as expresses on the website is the concept of upcycling. The showcase allows waste materials to be repurposed through the creative method, turning waste into treasure. The material in the window is the waste material produced by the company in the production. The brand uses the fantasy method to turn the waste material into giant socks, making the material itself more interesting. When consumers see such abnormal-sized socks, they feel as if they have entered a fairytale world or it's a Christmas holiday. Such a design can cause consumers to be curious about the material itself. Another signifier is the combination of letters "BOUF", the denotative signified is fantasy,

and the connotative signified in the context of sustainable supply chain expressed in their website is the fluffy and comfortable feeling of the sustainable material (British Wool). Associating fantasy and imagination with British wool used in the brand, "BOUF" stands for bouffant. Therefore, the connotative signified is comfortable feeling of the British wool and other fabrics the brand uses.

Summarized in Table 6, the sign of "Window of Katie Jones" enhances the customer's attention to the fabric of the brand itself through the bright colors of the sustainable fabric and the expression of the "fluffiness" of the fabric. In addition, the showcase uses the case of making excess fabric into socks to convey that the brand continues the fabric's vitality through creative design, which reflects principle 1 of the sustainability in fashion supply chain - reducing waste in end-of-life phase.

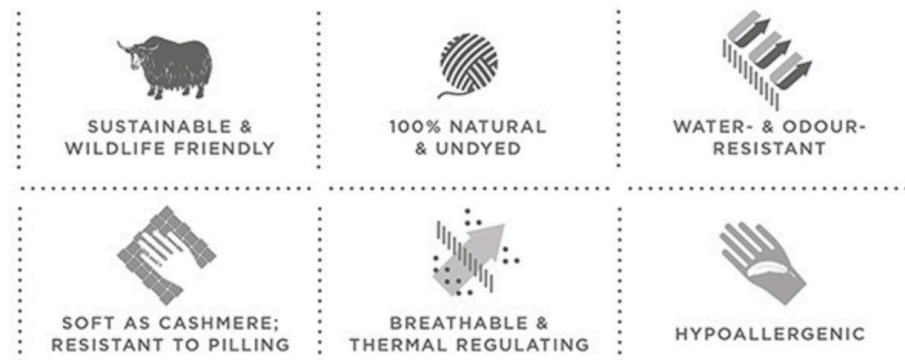
Table 6. Model of Semiotic Analysis of Katie Jones Window Display

Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Color	Red, green, orange and blue	Color and contrast between colors	making materials look more lively and vibrant	

Texture	fabric	Fantasy	Express the brand design concept of turning waste into treasure with creativity	principle 1, waste reduction in end-of-life phase
Text	Letters: "BOUF"	Lexical meaning	"BOUF" stands for bouffant, expressing the fluffy and comfortable feeling of the material.	

4.3 Tengri Window Semiotic Analysis

The untreated and undyed condition of Tengri Noble Fibre® makes it ideal for those with allergies. Our garments represent the natural colours of the Khangai Noble Yak.



Heritage craftsmanship

Tengri Khangai Noble Yarns are spun and woven into fabric in Yorkshire, at a family-owned mill where skills are passed from one generation to the next, and where textile manufacturing dates back to 1777.

To create yarns and fabrics of the highest quality, we combine the latest innovations in textile research and development with centuries of traditional craftsmanship.



Creating elegant cloths

Making Tengri fabric requires creative artistry and science, combining the best raw fibres and yarn construction to create a single ream of luxurious cloth.

We use natural processes with just water and soap to create a natural finish. The mineral-rich and soft Pennine waters that are unique to Yorkshire in the north of England are used to finish our cloths. The water helps to 'burst' our Khangai Noble Fibres, giving the cloth its distinguished luxurious handle and understated elegance.

To finish our cloths, we use natural methods such as brushing the fabric with wild harvested thistle-like teasel plants. Finally, a gentle steam is applied to the fabric, resulting in a cloth with a soft texture that creates a beautiful drape.



Design innovation

Our development technology, applied to fibres from the Khangai Yak, ensures that every Tengri garment is exquisitely soft, light, warmer than merino wool, hypoallergenic and durable. Our applied Noble Yarn Technology ensures that every garment is naturally resistant to water and moth.

The [Tengri Innovation Award](#) was launched in 2018 to encourage the implementation of sustainable fashion and textiles working towards a more sustainable industry standard and future.



Transparent and sustainable sourcing

Tengri, listed in [Sustainia100](#) as one of the world's leading sustainable business solutions, produces Khangai Noble Fibres® via a 100 percent transparent supply chain. We source our yak fibres directly from cooperatives made up of more than 4,500 herder families living in and around Mongolia's Khangai Mountains. The garments and yarns we create embrace the unique qualities of this very special fibre – qualities often under-recognised in the global textile industry.

According to the United Nations Development Programme, 90 percent of Mongolia is fragile dry-land – desertification threatens wildlife and biodiversity. Tengri's social enterprise with nomadic herders supports United Nations Sustainable Development Goals by promoting sustainable economic growth, ensuring sustainable production patterns, protecting and promoting sustainable natural ecosystems use, and combating desertification through our global partnerships for sustainable development.

Discover more about how we do business [here](#).



Experience Tengri products

The creation of Tengri fabrics is phased in line with nature's timing. It all starts when the baby Khangai Yaks shed their first winter coats – just 100 grammes of Khangai Noble Fibres is collected from each yak. With such an extremely limited supply, the journey from fibre to fabrics and a Tengri collection can take up to 24 months.

From accessories and home products to classic statement pieces with a modern and relaxed aesthetic, Tengri offers truly exclusive yet sustainable luxury.



Figure 5: Sustainability in fashion supply chain information from the website of Tengri (screenshots). Retrieved July 14, 2019 from <https://www.tengri.co.uk/sustainability>

The sustainability of the Tengri brand is mainly focused on the environmental protection of raw materials and associated processing technology. As can be seen on the brand's official website (Figure 5), Tengri guarantees the material's environmental sustainability and its wildlife-friendliness. In addition, the Tengri brand material does not undergo secondary bleaching and does not emit a toxic odor (principle 2, reduce pollution). The fabric is very soft and does not pill. The material is very breathable and can be thermally adjusted automatically. In terms of fabric processing technology, this brand combines traditional handcraft processing systems and innovative material processing techniques to ensure the originality of materials and naturalness of the yarn construction (principle 3, enhance material longevity by technology). The material's innovative technology makes the material resistant to water and maggots. Such scientific and technological innovations have enhanced the durability

of the material itself, prolonged the life of the clothes themselves, and achieved environmental sustainability (principle 3, enhance material longevity by technology). The material source of the Tengri brand is very transparent and sustainable. The yak fiber comes from 4,500 herder families. The company's clothing products are designed according to the special properties of the materials, fully respecting nature, and maximizing the development and utilization of the original properties of the materials. Achieving sustainability through respect for nature. In conclusion, from an environmental perspective, this brand has extended the life cycle of products through innovative processing of environmentally friendly materials. The Brand Tengri pursues "sustainability" according to characteristics of 2 and 3.



Figure 6: Window display of Tengri. Retrieved January 6, 2019 from <https://www.selfridges.com/US/en/features/articles/content/material-world-windows/>

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The signifiers in the window display are predominantly the yarn and sweaters. The visual merchandising methods are line and contrast, and the connotative signified in the context of sustainable supply chain is the comfort, softness and sustainability of nature-friendly yarn and sweaters. The Tengri brand's window is made of environmental-friendly raw yarn and three sweaters, which are mainly represented by line and contrast visual merchandising design methods to express the sustainability of the brand. From a visual point of view, a large number of straight lines represent strength and vitality. The three pieces of clothing outline soft lines, giving people a feeling of softness and natural affinity. In contrast to the straight lines, the soft lines show the comfort, softness and sustainability of nature-friendly materials, giving customers the urge to try them on.

The signifier is the yarn and the sweater, the denotative signified is proportion, and the

connotative signified in the context of a sustainable supply chain, claimed in the brand's website is represents that the brand pays attention to the yarn and raw materials. In terms of the visual composition of the window display, yarn occupies 80% of the window display area, while the main display sweaters only occupy about 20% of the area, which is arranged in the lower right corner of the window display. This novel composition means that the brand pays great attention to yarn, that is, the raw materials of this clothing product.

To sum up, listing in Table 7, the Sign of "Window of Tengri" attracts customers' attention to the performance of raw materials through materials, lines, contrasts and special visual composition ratios, thereby expressing the brand's use of technological innovation to enhance the durability of materials. This reflects the third "sustainability" according to characteristics of 2 and 3, which is reducing waste, pollution as well as extending the life of material.

Table 7. Model of Semiotic Analysis of Tengri Window Display

Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Texture	Sweater	Material	Soft sweater texture	
Prop	Yarn and sweaters	Line and contrast	In contrast to the straight lines, the soft lines show the comfort, softness and sustainability of nature-friendly yarns	
Space	The yarn and the sweater	Proportion	Yarn occupies 80% of the area. This novel composition represents that the brand pays attention to the yarn and raw materials	principle 2, reduce pollution principle 3, enhance material longevity by technology

4.4 VYAYAMA Window Semiotic Analysis

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VYAYAMA

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RESPONSIBLE FASHION

ETHICAL PARTNERS

In our efforts to find the right partners for fabric and production we searched through both the US and Europe. We took our time to seek partners who also believe in responsibly produced product and whose teams are protected by unions and strict health and safety standards.

STRATEGIC GEOGRAPHIC LOCATIONS

Our global search for the latest innovations created under these optimal conditions brought us to Portugal.

The regions where we hold our main productions are called Vale do Cávado and "Vale do Ave". The Cavado and Ave are two beautiful rivers that run alongside the Vale/'valley'.

We are proud to share that all the dye-houses of our production facilities have clean internal water treatments and in no way create any negative impact on the local environment.

More details contact: www.atp.pt



Figure 7: Sustainability in fashion supply chain information from the website of VYAYAMA (screenshots). Retrieved July 14, 2019 from <https://www.vyayama.com/pages/responsible-fashion>

FINDINGS

The brand VYAYAMA says on its website (Figure 7) that it takes responsibility from a social, cultural as well as an environmental perspective. From the social and cultural perspective, the company claims that every selected employee on the team of production material suppliers is treated equally (principle 11, respect rights of employees). Treatment, protected by the sound health regulations, reflects the characteristics 9 of sustainable principles, which is respect the individual rights of employees of the company. From environmental perspective, first, the company guarantees that the sewage generated during the processing of materials and dyeing and washing of fabrics has its own treatment system, which will not affect the surrounding environment (principle 2, reduce pollution to environment). Second, VYAYAMA's fiber and yarn spun are produced and processed in the same place, which can reduce the environmental pollution caused by materials during transportation (principle 7, low-carbon

transportation). Third, the company guarantees the safety of the materials, and the company guarantees that the materials are non-toxic and harmless to human skin (principle 2, reduce pollution to human). Therefore, Company VYAYAMA pursues sustainability according to characteristics 2, 7 and 11.



Figure 8: Window display of VYAYAMA. Retrieved January 6, 2019 from <https://www.selfridges.com/US/en/features/articles/content/material-world-windows/>

The signifier is flexible fiber fabric, and the connotative signified in the context of sustainable supply chain is expressing that the elastic material has excellent performance. The performance of the material is shown through the stretching of the fabric. Again, the signifier is the stretch fabric, the visual merchandising methods are the line and curve, and the connotative signified in the context of sustainable supply chain is expressing a sense of rhythm and the performance of the material. Curves and lines with different curvatures make this picture rich in rhythm and very easy to become the visual center.

The signifier is the yoga wear, the denotative signified are rhythm and dominance, and the connotative signified in the context of sustainable supply chain is expressing the safety and green performance of the fabric. There are three shapes in the window display: triangles made of elastic cloth,

and slender straight shapes that support clothes. These three shapes make the window display visually very balanced and have a sense of hierarchy. The sense of rhythm makes the window display more coherent and more readable and attracts customers' attention to the safety and green performance of the fabric when made into Yoga wear.

To sum up, listing in Table 8, the Sign of “Window of VYAYAMA” showcases yoga clothes and stretch fabrics through the visual merchandising methods of line, curve, rhythm and dominance. The yoga clothes and fabrics displayed in the window are full of vitality, reflecting the soft and malleable properties of the materials. This reflects the characteristic 2 of the sustainability principles but does not reflect the characteristic 7 and 11.

Table 8. Model of Semiotic Analysis of VYAYAMA Window Display

Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Texture	Flexible fiber fabric	Material	The material is elastic and has excellent performance.	
Props	Stretch fabric	Line and curve	Expressing a rich sense of rhythm and the excellent performance of the material	principle 2, reduce pollution to human
	Yoga wear	Rhythm and Dominance	The sense of rhythm makes the picture more coherent and more readable, expressing the safety and green performance of the fabric when made into Yoga wear.	

4.5 TORTOISE Window Semiotic Analysis

TORTOISE

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ABOUT US

PIONEERING THE NATURALLY DERIVED, ENVIRONMENTALLY NONINVASIVE WISER WASH® PROCESS

TORTOISE DENIM IS THE RESULT OF A DREAM TO PUT SUSTAINABILITY AT THE CORE OF THE DENIM INDUSTRY. WE ARE THE FIRST AND ONLY BRAND THAT HAS CONTINUOUSLY IMPLEMENTED METHODS OF WASHING THAT ENTIRELY ELIMINATED THE NEED TO USE ANY CORROSIVE CHEMICALS AS WELL AS USING MORE THAN 90% LESS WATER THAN TRADITIONAL LAUNDRIES. TORTOISE DENIM WAS ESTABLISHED IN THE YEAR 2013 WITH THE INITIATIVE TO RESPONSIBLY INNOVATE AND GO BEYOND THE TECHNOLOGIES THAT ARE TODAY CONSIDERED STANDARD IN WASHING JEANS. WE OFFER NEW POSSIBILITIES FOR EXPANDING THE TYPES OF WASHES CURRENTLY ACHIEVABLE, MAKING PRODUCTION MORE SIMPLE AND EFFICIENT, ALL THIS WITH THE MINIMAL USE OF RESOURCES. WE BELIEVE THAT ATTRACTIVE LOOKING DENIM CAN STILL BE ACHIEVED AND AT THE SAME TIME RESPECT OUR NATURAL RESOURCES. THIS PROPRIETARY TECHNOLOGY IS WHAT WE CALL THE WISER WASH. THE WISER WASH PROCESS ELIMINATES THE USE OF PUMICE STONES AND TOXIC CHEMICALS INVOLVED IN TRADITIONAL WASHING WHILE STILL ACHIEVING BEAUTIFUL ABRASIONS AND BRIGHT CONTRASTS THAT REVEAL THE TRUE BEAUTY OF INDIGO DENIM.

Figure 9: Sustainability in fashion supply chain information from the website of TORTOISE (screenshot). Retrieved July 14, 2019 from <https://tortoisedenim.com/pages/about-us>

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According to the website (Figure 9), TORTOISE uses the technology they developed to clean denim, called the Wisser Wash Process, to clean denim products. This product not only does not use harmful cleaning agents, but also saves 90% of water resources than ordinary cleaning methods (principle 3, enhance material longevity by technology). Moreover, this cleaning method can preserve the original beautiful appearance of denim products to the greatest extent on the basis of protecting the environment, thereby extending the life of the products (principle 21, enhance product durability by adding emotional value). The brand regards the sustainability of product after-sales as its core competitiveness, and provides people with clothing and aesthetic enjoyment based on technological innovation, protecting the environment, and saving social resources. The TORTOISE brand achieves sustainability and pursues “sustainability” according to the characteristics of 3 and 21. from

the perspective of consumer service design.



Figure 8: Window display of VYAYAMA. Retrieved January 6, 2019 from <https://www.selfridges.com/US/en/features/articles/content/material-world-windows/>

The signifier are the jeans, the denotative signified is the particular type of material, and the connotative signified in the context of sustainable supply chain is High-tech washing technology for denim and transparency. TORTOISE's window display uses environmentally friendly denim

fabric together with the jeans. And the jeans in the window bring consumers to mind where and how these jeans are made.

The signifier is also the denim strip, the visual merchandising method, thus, the denotative signified is dominance, and the connotative signified in the context of sustainable supply chain is highlighting the importance of denim cloth in the company's production. Specifically, in the window display, the jean is layered vertically to highlight the denim cloth displayed in the horizontal direction. The layered denim highlights the importance of denim cloth in the company's production.

The signifier is the denim strip, the method is repetition, and the connotative signified in the context of sustainable supply chain is expressing the brand's attention to hand-modified fabrics. The window display uses a large area and a large number of repeatedly arranged strips of

cloth. This display method is to achieve a visual balance with the jeans products that are also repeatedly displayed, thereby forming a harmonious image. In this window, the proportion of fabric is much larger than that of jeans.

To sum up, listing in the table 9, the Sign of "Window of TORTOISE" promotes customers' attention to materiality through the display of denim fabric and jeans, repeated display of denim fabric and constructive space creation, thus showing that the brand's core competitiveness is the durability of materials and research and pursuit of sustainability. And it reflects the company pursuit of sustainability according to characteristics 3, which is improving the use phase to make products last, but does not reflect characteristics 21.

Table 9. Model of Semiotic Analysis of TORTOISE Window Display

Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Texture	Jean	Material	High-tech washing technology for denim and transparency	principle 3, enhance material longevity by technology
Props	Denim strips	Dominance	The denim cloth not only helps to show the jeans, but also highlights the importance of denim cloth in the company's production.	
		Repetition	Achieving a visual balance with denim products, expressing the brand's attention to fabrics through a harmonious image	
Space	Space composition of jeans and denim strips	Proportion	The denim fabric takes up more space than the denim material itself, which represents the brand's attention to the fabric.	

4.6 Deadwood Window Semiotic Analysis



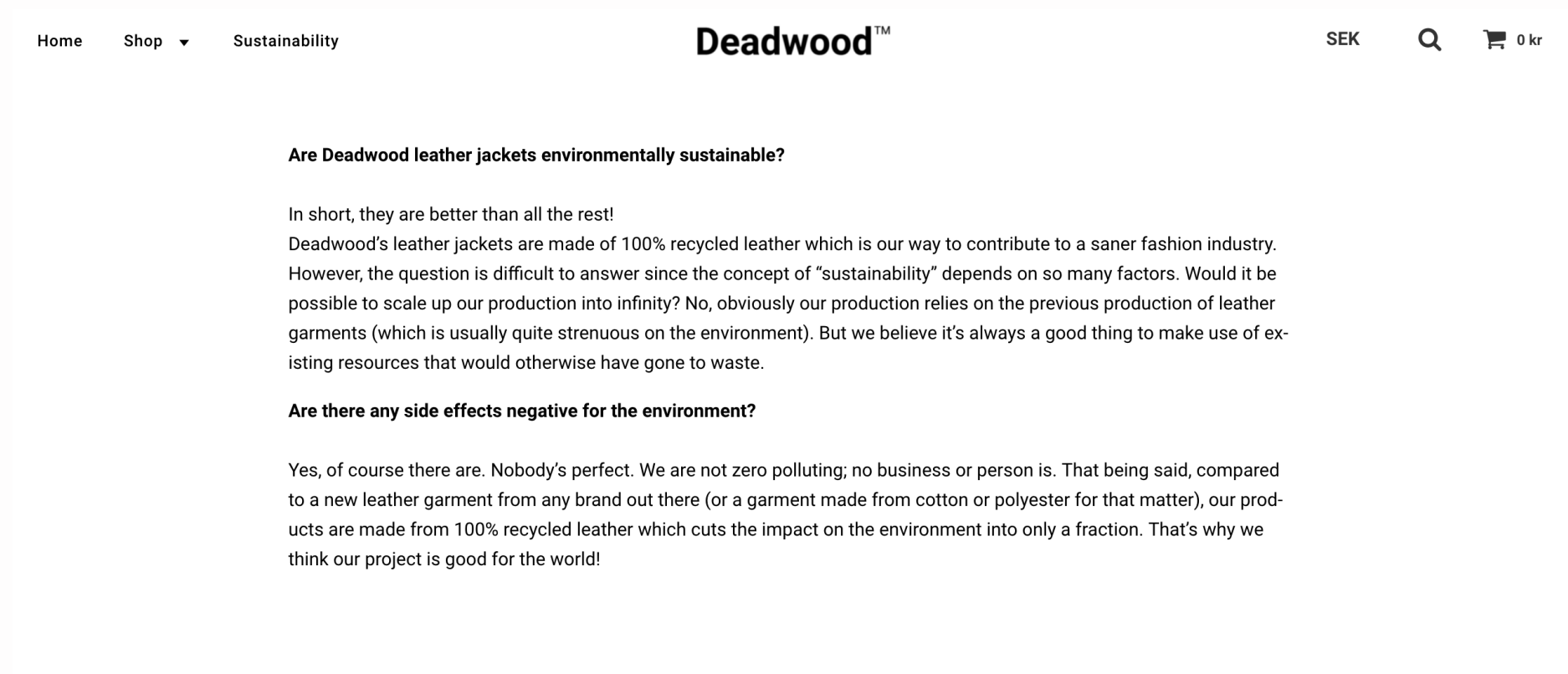


Figure 11: Sustainability in fashion supply chain information from the website of Deadwood (screenshots). Retrieved July 14, 2019 from <https://www.deadwoodstudios.com/pages/sustainability>

According to the Deadwood brand website (Figure 11), the brand attaches great importance to the sustainable use of raw materials, mainly reflected in two levels; namely the environmental level and the design level. From an environmental perspective, the brand's raw material source is 100% recycled old leather (principle 4, material recyclability). This approach not only directly saves leather resources found in nature, but also reuses used or discarded leather. From a consumer service perspective, the brand's re-cutting and shaping of old leather pieces, has given leather a second life through design and creativity. This approach reshapes the concept of "fashion" in people's minds (principle 21, enhance product durability by adding emotional value). Through the change of concept, people pay more attention to the value of sustainability in fashion, thereby changing people's aesthetic value orientation and consumption habits. In summary, the Deadwood brand pursues "sustainability"

according to the characteristics of 4 and 21.



Figure 12: Window display of Deadwood. Retrieved January 6, 2019 from <https://www.selfridges.com/US/en/features/articles/content/material-world-windows/>

The signifier is the recycled leather, with the denotative signified being material, and the connotative signified in the context of sustainable supply chain is expressing the brand's awareness of the sustainability of raw materials. Specifically, the use of the brand's leather clothing products,

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used as display props in the window displays, shows that the brand itself is very confident in their materials.

The signifier is the leather clothes folded into different shapes, the denotative signified is rhythm, and the connotative signified, in the context of sustainable supply chain, is reflecting the brand culture of creativity, as productivity, by using creative design approaches to diversify product styles. This window uses the rhythm and the lines of the window design method where leather clothes are stacked into different shapes, showing different parts of the garments. Such a rhythmic display method adds visual vitality to the window display, giving it a readable narrative. The use of creative design methods and second tailoring have given recycled leather a second fresh life. Different folding methods make clothes show a variety of dynamic lines, such as different lengths and directions. The secondary cutting

of recycled materials reflects the brand's concept of reshaping fashion and sustainability, as well as, the spirit of innovation.

The sign of “Window of Deadwood” uses the display of recycled leather materials to reflect the brand's emphasis on the sustainability of raw materials, thereby reflecting the characteristics of 4 from the environmental perspective, which is the maximum the recycling rate of waste material. Second, through the visual merchandising methods such as rhythm and line, the window display uses clothes stacked in different shapes to reflect the importance of secondary creative tailoring in the brand. This reflects the sustainability according to characteristics 21, which is using innovation and creative design to extend the life of products. The information is listed in Table 10.

Table 10. Model of Semiotic Analysis of Deadwood Window Display

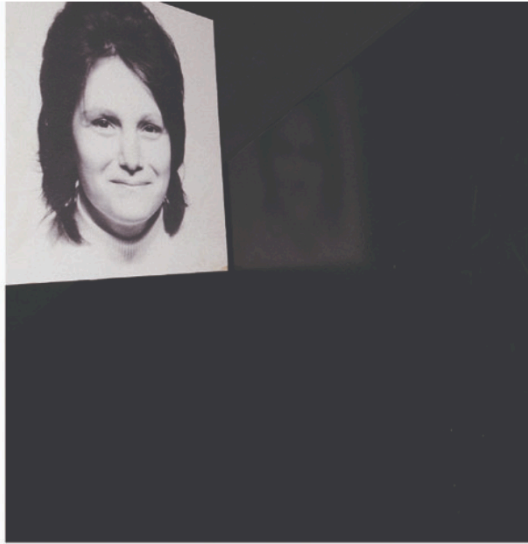
Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Texture	Recycled leather	Material	Expressing the brand's awareness of the sustainability of raw materials	principle 4, material recyclability
Prop	leather clothes Folded into different shapes	Rhythm	Reflecting the brand culture of creativity as productivity by using creative design approaches to diversify product styles	principle 21, enhance product durability by adding emotional value
		Line	Showing the creativity and diversity of this clothing brand in the second tailoring of raw materials as well as better Reflecting the brand's concept of reshaping sustainable fashion	principle 21, enhance product durability by adding emotional value

4.7 LE KILT Window Semiotic Analysis

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LE KILT

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Manifesto

KEY WORD REFERENCES

learning, tools, nostalgia, craft, knowledge, innovation through tradition (end goal), repair, timelessness, education, heirloom, family narrative, community, inquisitiveness, understanding, patience, collaboration, loyalty, identity, vulnerability of raw materials, integrity.

EDUCATION

Learning and practice allows ideas to grow and skills to develop. Le Kilt's beginnings started with the passing on of family traditions and knowledge. The evolution of the brand resembles a family tree, starting off as small roots which grow with each generation. With a nod to nostalgic notions of the past, identity is also celebrated through the establishment of new traditions and techniques. It is through this idea that we consider how each element of our daily uniform can be taken apart and re-appropriated as something new.

COMMUNITY

Togetherness and the opportunity for collaboration are both central to Le Kilt's brand values. Working with others to incubate and expand knowledge of traditional craft as well as to encourage conversation and inspire curiosity creates clear lines of progress.

CRAFT

Looking at the qualities of raw materials such as wool - identifying flaws but also celebrating its strength - we consider the unique properties of each component in the construction of our garments. By focusing on the use of tools and workmanship it places emphasis on the individual, therefore demonstrating our loyalty to the craftspeople themselves. In addition, we feel it is important to emphasise how the lengthy production process of wool is often at odds with the lifecycle of the finished garment. Repair increases sustainability; a garment's imperfections can expose something beautiful, something that can be passed down through generations as a timeless heirloom. By incorporating this into Le Kilt's brand narrative we hope to increase consumer understanding about the importance of patience and integrity.



Figure 13: Sustainability in fashion supply chain information from the website of LE KILT (screenshots). Retrieved July 14, 2019 from <http://lekilt.co.uk/manifesto/>

According to the introduction of LE KILT on their website (Figure 13), Le Kilt is a brand that inherits and innovates the ideas of Scottish heritage. The brand works with small British manufacturers to promote sustainable cultural heritage. For example, the brand

encourages customers to consume quality, rather than pursue quantity. This brand mainly reflects sustainability from the perspective of design and social culture. From a service and design perspective, the company has added to the brand's narrative, the notion that refinished sweaters are beautiful and worthy of inheritance (principle 21, enhance product durability by adding emotional value). The brand is spreading the concept of sustainable fashion by reshaping people's understanding of the cycle and method of use for clothing. In addition, the brand hopes that people can feel the warmth and memory of time passed in handmade clothes. (principle 21, enhance product durability by adding emotional value). From a social and cultural perspective, the brand promotes the craftsmanship of clothing production in the community, and cultivates traditional craftsmanship. This brand also runs creative workshops in the community, training local young people on traditional manufacturing

processes (principle 18, establish social benefits for people). This approach is very conducive to the cultural craftsmanship and the establishment of a brand image. At the same time, when young people learn craftsmanship, they will provide new ideas for innovative craftsmanship, which is conducive to the sustainable development of the craftsmanship. To sum up, the LE KILT brand pursues "sustainability" according to the characteristics of 21, which is design for durability by adding emotional value. And the brand pursues "sustainability" according to the characteristics of 18, which is establish from the perspective of culture and society a good and socially oriented image.



Figure 14: Window display of LE KILT. Retrieved January 6, 2019 from <https://www.selfridges.com/US/en/features/articles/content/material-world-windows/>

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The signifier is color combinations of red, green, blue and black. The denotative signified is color, and the connotative signified in the context of sustainable supply chain is conveying the brand's emphasis on traditional culture and Scottish weaving. Scottish weaving of kilts can attract consumers due to its added emotional value, because these typical Scottish colors remind customers of their culture and heritage. Red, green, blue, and black are used in three places in the window, namely kilts, carpets and woolen shafts. The combination of red, green, blue, and black exudes a Scottish flair. It symbolizes the cultural colors of kilts, rugs, and woolen shafts reflected in the brand's emphasis of traditional Scottish weaving.

The signifier is Scottish texture, the denotative signified is material, and the connotative signified in the context of sustainable supply chain, claimed in brand's website. Through their website the brand aims to emphasize their fabrics

and product quality. The largest area of display material in the window is Scottish fabric. The soft fabric gives a prideful, yet nostalgic feeling (Pegler, 2016), which can enhance customers' trust in the brand's fabric. Of all the products and props displayed, the proportion of cloth display is about 70%, which shows that the brand attaches importance to cloth and product quality.

The signifier is the hanging rod, the denotative signified is line, and the connotative signified in the context of sustainable supply chain is helping the kilts to be displayed regularly, reflecting the skirt weaving methods. The hanging rod connotes that the kilts are handmade and locally produced.

The signifier is the woolen shaft, the denotative signified are rhythm and repetition. The connotative signified in the context of sustainable supply chain, highlighting the sustainable use of the dress, handmade craftsmanship leading to an increased lifespan of the dress. The sense of rhythm increases this narrative of the window (Pegler, 2016). The whole static window seems to be telling the story of a skirt being knitted. Such a narrative expresses the brand's desire to convey a sustainable fashion concept of re-dressing. The brand hopes that consumers can feel that fashion is not only fresh, but also holds a piece of memory and time.

The Sign of "Window of LE KILT" expresses the brand's emphasis on the beauty and heritage through their display of kilts. The kilts also emphasize color and materials in the window, which pursues "sustainability" according to the characteristics of 20, enhancing product durability by adding emotional value. On the one hand, the brand expresses the sustainable fashion concept of

“handmade kilts, increases sustainability” by creating a visual image with rhythm and narrative sense. This reinforces the idea of “sustainability” according to the characteristics of 21. However, this window does not reflect the characteristics of 18, which is establishing social benefits for people. The information is listed in Table 11.

Table 11. Model of Semiotic Analysis of LE KILT Window Display

Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object		First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Color	color combinations of red, green, blue and black	Color	Conveying the brand's emphasis on traditional culture and beautiful Scottish weaving	principle 21, enhance product durability by adding emotional value
Texture	Scottish texture	Material	Conveying the brand's emphasis on fabrics and product quality	
Props	the hanging rod	Line	Helping the skirts to be displayed regularly, reflecting the skirt handmade methods	principle 21, enhance product durability by adding emotional value
	the woolen shaft	Rhythm and repetition	Highlighting the sustainable use of the dress, which is handmade to increase the life of the dress.	principle 21, enhance product durability by adding emotional value

4.8 Summary of Semiotic Model in Windows

The table 12 summarized whether brands' sustainability in fashion supply chain mentioned in websites, reflected in their window displays, and from which perspectives.

Specifically, BOTTLETOP reflects the environmental perspective (principle 4, 7), cultural and social perspective (principle 18), and consumer service perspective (principle 22) in the sustainability in fashion supply chain on their website. However, in the BOTTLETOP window design, it only reflects the cultural and social perspective (principle 18). Katie Jones reflects the environment perspective (principle 1, 4) and consumer service perspective (principle 22) in the sustainability in fashion supply chain on their website. In the design of Katie Jones window, however, only the environmental perspective (principle 1) is reflected. Tengri reflects the environment perspective (principle 2, 3) of sustainability in fashion supply chain in the website and is reflected in the Tengri window. VYAYAMA reflects the environmental perspective (principle 2, 7) and cultural and social perspective (principle 11) in the sustainability in fashion supply chain on their website. However, the VYAYAMA window design only reflects the environmental perspective (principle 2). TORTOISE reflects the environment perspective (principle 3) and

consumer service perspective (principle 22) in the sustainability in fashion supply chain on their website, but the window design only reflects the environmental perspective (principle 3). Deadwood reflects the environmental perspective (principle 4) and consumer service perspective (principle 22) in sustainability in fashion supply chain on their website and is reflected in the Tengri window. LE KILT reflects the cultural, social (principle 18) and consumer service perspective (principle 22) on their website, while the BOTTLETOP window design reflects consumer service perspective (principle 22).

Table 12. Summary of List of Sustainability in Fashion Supply Chain in Websites Reflected in the Windows

The Fashion Brands	Sustainability in Fashion Supply Chain Mentioned in Websites	The Perspective	Weather Sustainability in Fashion Supply Chain Mentioned in Websites Reflected in the Windows or not (YES / NO)
BOTTLETOP	principle 4, material recyclability	Environment perspective	NO
	principle 7, low-carbon transportation	Environment perspective	NO

	principle 18, establish social benefits for people	Cultural and social perspective	YES
	principle 21, enhance product durability by adding emotional value	Consumer Service perspective	NO
Katie Jones	principle 1, waste reduction in end-of-life phase	Environment perspective	YES
	principle 4, material recyclability	Environment perspective	NO
	principle 21, enhance product durability by adding emotional value	Consumer Service perspective	NO
Tengri	principle 2, reduce pollution	Environment perspective	YES
	principle 3, enhance material longevity by technology	Environment perspective	YES
VYAYAMA	principle 2, reduce pollution to environment	Environment perspective	YES
	principle 2, reduce pollution to human	Environment perspective	YES

	principle 7, low-carbon transportation	Environment perspective	NO
	principle 11, respect rights of employees	Cultural and social perspective	NO
TORTOISE	principle 3, enhance material longevity by technology	Environment perspective	YES
	principle 21, enhance product durability by adding emotional value	Consumer Service perspective	NO
Deadwood	principle 4, material recyclability	Environment perspective	YES
	principle 21, enhance product durability by adding emotional value	Consumer Service perspective	YES
LE KILT	principle 18, establish social benefits for people	Cultural and social perspective	NO
	principle 21, enhance product durability by adding emotional value	Consumer Service perspective	YES

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The table 13 summarized the information from Table 5 to table 11, which is, sustainability in Fashion Supply Chain in websites that reflected through objects in the windows. And table 12 will be further discussed in Chapter 5.

Table 13. Model of Semiotic Analysis and Summary of 7 Window Displays

The fashion brands	Signifier		Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
	The object		The relation between Signifier and Signified (design method)	The meaning (design concept) in the context of sustainable supply chain in fashion claimed in brand website	
BOTTLETOP	Color	White	Color: pure and innocent	the affinity of empowering people	principle 18, establish social benefits for people

	Prop	Russian dolls	Fantasy	Representing people around the world that the BOTTLETOP brand has helped and empowered since 2002.	principle 18, establish social benefits for people
			Line	Communicating "human and socially friendly behavior"	principle 18, establish social benefits for people
	Space	Russian dolls Placement	Rhythm	The range of people that brands help has spread all over the world	principle 18, establish social benefits for people
	Text	"THE HUMAN FACE OF FASHION"	Text	The people who have been helped by the fashion brand business	principle 18, establish social benefits for people

Katie Jones	Texture	fabric	Fantasy	Express the brand design concept of turning waste into treasure with creativity	principle 1, waste reduction in end-of-life phase
Tengri	Space	The yarn and the sweater	Proportion	Yarn occupies 80% of the area. This novel composition represents that the brand pays attention to the yarn and raw materials	principle 2, reduce pollution principle 3, enhance material longevity by technology
VYAYAMA	Prop	Yoga wear	Rhythm and Dominance	The sense of rhythm makes the picture more coherent and more readable, expressing the safety and green performance of the fabric when made into Yoga wear.	principle 2, reduce pollution to human

TORTOISE	Texture	Jean	Material	High-tech washing technology for denim	principle 3, enhance material longevity by technology
Deadwood	Texture	Recycled leather	Material	Expressing the brand's awareness of the sustainability of raw materials	principle 4, material recyclability
	Prop	leather clothes Folded into different shapes	Rhythm	Reflecting the brand culture of creativity as productivity by using creative design approaches to diversify product styles	principle 21, enhance product durability by adding emotional value
			Line	Showing the creativity and diversity of this clothing brand in the second tailoring of raw materials as well as better Reflecting the brand's concept of reshaping sustainable fashion	principle 21, enhance product durability by adding emotional value

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LE KILT	Color	color combinations of red, green, blue and black	Color	Conveying the brand's emphasis on traditional culture and beautiful Scottish weaving	principle 21, enhance product durability by adding emotional value
	Prop	The hanging rod	Line	Helping the skirts to be displayed regularly, reflecting the skirt handmade methods	principle 21, enhance product durability by adding emotional value
		the woolen shaft	Rhythm and repetition	Highlighting the sustainable use of the dress, which is handmade to increase the life of the dress.	principle 21, enhance product durability by adding emotional value

5 DISCUSSION

5 DISCUSSION

This chapter discusses how the findings relate to research questions. This chapter will analyze and discuss the findings with relevant literature to find out how the objects in window displays convey sustainability in fashion supply chain.

5.1 Object communication

Among the seven windows investigated by the author, the object in the window with the most sustainable concepts are props, which are reflected in four windows, including brand BOTTLETOP, VYAYAMA, Deadwood and LE KILT (Table 13). The next prop is texture, and it is reflected in three windows, including Katie Jones, TORTOISE and Deadwood. In addition, two windows use color and space. Text has been used the least, only in one of the seven windows investigated.

According to the analysis results, the frequency of the use of the object prop is the highest in the shop window, which mainly expresses the sustainable fashion supply chain of consumer service in the brand website. Next is the texture, which mainly expresses the environmentally sustainable fashion supply chain of the brand's website in the window.

Furthermore, the symbols of color, space and text are less likely to be used, which mainly express the sustainable fashion supply chain in cultural and social aspects of the brand website.

According to the results, prop is the most frequently used object, that is, the visual symbol in the window with the theme of expressing a sustainable supply chain. Abarajithan (2013) once mentioned that prop is a very important carrier to explain the product concept in the window design. The author's findings further support and complement this theory. According to the research results, the author found that most of the window displays that express sustainable supply chains choose products or materials of sustainable fashion brands as props to express sustainability in fashion supply chain. According to literature review, a mannequin is the most commonly used prop in the window design of fashion brands (Pillai et al., 2011), especially in the display of clothes, fabrics and other related products. According to the analysis of the windows connoting sustainability, the sustainable principles of the brands are presented by other props than mannequins. It is easier for customers to obtain information about the products, such as fabric and material (Ha & Lennon, 2010). Therefore, this research found that the window displays of sustainable brands mainly relied on the products and materials as the props of an expression of sustainability.

The study also found that the color was used only infrequently in window displays for sustainable brands, appearing in only one of seven window displays, which is BOTTLETOP. In previous literature, color, as an object, is a key element to spread brand characteristics in the window as the effect of color is mainly to create a certain atmosphere (Pegler & Kong, 2018). In the presented windows, color was seldom used as the method to communicate sustainability. Therefore, compared with prop and texture, color is not seen as a way to communicate sustainability information, which the brands wanted to communicate. This study found that prop is the most popular visual symbol, followed by texture. These two objects can very effectively express the sustainability in fashion supply chain information in the brands' websites.

5.2 Visual Merchandising Communication

According to the findings and Table 13, rhythm is the most frequently used visual merchandising method that embodies the concept of sustainability. It is reflected in four windows, expressing the sustainability of the environment, cultural and social and consumer service perspective. The second is line, which is used in three windows to express the sustainability of the cultural and social and consumer service perspective. In addition, color, fantasy, and material are used in two windows,

respectively. Text, promotion, dominance, and repetition are the least frequently used. They appear in one window respectively, expressing the sustainability of the environment, cultural and social, and consumer service perspective.

According to the findings, rhythm and line are the visual merchandising methods that reflect the most sustainable ideas in the window display with the theme of expressing sustainable supply chains, and the frequency of color is relatively low. Color is considered the most common visual merchandising method in window design (Pegler & Kong, 2018). According to the literature review, rhythm can lead customers' eyes and allow customers to notice each exhibit in the window in turn, which is conducive to the display of window details (Abarajithan, 2013). In addition, because the line is composed of a fixed point and a series of directional moving points, the line also has the function of leading and influencing the customer's eyes in the window, so that the customer can understand the window more deeply and comprehensively. In contrast, the biggest function of color is to quickly form the first image in the mind of consumers, and the main function is to quickly attract consumers' attention. In sustainable showcases, rhythm and line usually need to express sustainable information in the environment, cultural and social, and consumer service perspective, and they need to express more

DISCUSSION

details. Because the sustainable brand's window hopes that consumers can pay attention to the details of the brand's products, for example, focusing on the brand's fabrics are friendly to the environment and the human body (Yan & Yazdanifard, 2014). In summary, the main function of sustainable brand window is not only to attract consumers, but also attract consumers to read the details in the window. Therefore, in the window theme of sustainable brands, the use of rhythm and line visual merchandising methods is greater than color.

At the same time, based on the above theory, it can also be explained in the finding. In the window with the theme of expressing sustainability in the fashion supply chain, line is a very popular way of visual merchandising only after rhythm. Pegler and Kong (2018) mentioned that line is second only to color in window design and is a very common and popular visual merchandising method. The author further refines and enriches this theory. Among sustainable window themes, rhythm is the most popular, followed by line.

In summary, in the window display with the theme of expressing sustainability in the fashion supply chain, rhythm is the most popular visual merchandising method, followed by line, which mainly expresses the sustainability of environment, cultural and social, and consumer service

perspective.

5.3 Sustainability in Fashion Supply Chain Reflection

According to the literature review and Table 12, it is found that the sustainability in the fashion supply chain is composed of four levels, namely the environment perspective (principle 1-7), economic perspective (principle 8-10), cultural and social perspective (principle 11-18), and consumer service perspective (Principle 19-25).

According to findings, the sustainability in the fashion supply chain reflected by the fashion brand on the website reflects the poor integrity of the information in the window. The sustainability in the fashion supply chain embodied by the fashion brand on the website is concentrated in three aspects, namely the environment perspective, the cultural and social perspective, and the consumer service perspective. However, in most brands, the window shows only part of the principles from each perspective. Only two of the seven window displays, which are Tengri and Deadwood, reflect the sustainability in the fashion supply chain mentioned in their websites.

The fashion brands reflect the sustainable information of environment

perspective, cultural and social perspective, and consumer service perspective in their websites. Second, the sustainability in fashion supply chain from the perspective of environment and consumer service are most frequently reflected in the website and window design of sustainable fashion brands. Thirdly, the information of sustainability in the fashion supply chain reflected in the window of a sustainable fashion brand is far less than that in its website, and the information is not fully expressed.

6 CONCLUSIONS

6 CONCLUSIONS

This chapter summarizes the research and proposes practical significance. In addition, the limitation of the research and suggestions for next step have been discussed.

6.1 Research Summary

This thesis studies and summarizes how middle and high-end fashion brands express sustainability in the fashion supply chain in their window displays. At present, researches related to fashion window displays mainly focus on the relationship between the use of visual merchandising in window displays and customer behavior, as well as the window making technology and spatial planning. There are few theoretical studies on how the windows of fashion brands can express the theme of sustainability through visual merchandising. This study will fill the gap in this field by analyzing seven shop windows that promote sustainability in the fashion supply chain on their official website.

This study aims to analyze how window displays of high-end fashion brands use visual merchandising to show their sustainability in the fashion supply chain in the website from the perspective of semiotics.

In this study, Roland Barthes' semiotic model was applied to the window system to generate "Model of Semiotic Analysis", and to analyze research material (the images of the windows and the company websites) from three perspectives: the window system object, the visual merchandising method and the sustainable theme expressed by the window. This is to summarize how the objects in the window of the fashion brands use the visual marketing method to express its window theme.

First of all, through studying and reviewing the existing knowledge of the sustainable supply chain of fashion brands, this thesis concludes that the sustainability of the fashion supply chain includes four perspectives: environment, economy, cultural and social, and consumer service, with a total of 25 guidelines. In addition, the author also outlined the visual merchandising method of window display through literature to provide theoretical support for window design analysis.

Secondly, this study selected seven windows among the mid-to-high-end fashion brands as the research objects, and compared their visual sign system to the information on sustainability that is provided on the company websites. The criteria for choosing the research objects was that the fashion brand should meet two conditions at the same time to have sustainability in the fashion supply chain information, and to have windows

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that convey information on sustainability. The author found seven windows that met the requirements, and collected sustainability information from the seven showcase websites, reflecting on the 25 sustainability principles that were identified in the literature. The “Model of Semiotic Analysis” was then used to analyze the object, methods of visual merchandising, and the expression of sustainability in the fashion supply chain. Through the comparison and analysis of the information collected from the seven windows, the following conclusions are drawn. In current window displays of fashion brands with the theme of expressing sustainability, prop and texture are most popular as visual objects, and rhythm and line are used as methods of visual merchandising to express the sustainable supply chain information of environment perspective and consumer service perspective in fashion brand websites. The fashion companies tend to depart from the traditional mannequin centered window display and emphasize the products, processes, functions and materials instead. However, the information of sustainability in the fashion supply chain, available on websites of the companies, is only partially reflected in the window displays.

6.2 Practical Significance

This subchapter discusses the practical significance of this study. The

conclusions of this thesis can better guide window designers to design sustainable window spaces for fashion brands and enable designers to more strategically help fashion brands express sustainability in the fashion supply chain in their websites. In addition, this theory enables brands and designers to raise awareness of sustainable window design and continuously enrich their theories of sustainable window design.

For brands, while satisfying consumer needs and improving consumer experience, it is also beneficial to spread sustainable concepts as an added value. Information sharing can make them more quickly and easily understand sustainable principles of fashion brands and increase their trust in consumer brands through transparent sustainable information in the window. At the same time, it can better monitor the brand to keep the supply chain sustainable.

This thesis proposed the “Model of Semiotic Analysis” for window displays, based on relevant theories of window design and semiotics. This semiotic analysis model enriches the research and analysis framework of semiotics, taking the window as the research object enables researchers to analyze the subject connotation expressed by window design and visual merchandising methods. Furthermore, understanding how certain messages are communicated through window display design, might

help the visual merchandisers in communicating desired concepts.

6.3 Limitations of the Research

Although this thesis has improved the practical design methods and strategies of fashion brands' sustainable windows from the perspective of semiotics, it still has certain limitations, mainly reflected in the selection of samples and research methods.

First of all, the study only analyzed seven windows that met the requirements, and the research number of samples was relatively small. In addition, most of the seven shop windows are clothing brands, covering a less comprehensive range of fashion products, which also affects the accuracy of the research results to some extent.

Although semiotic analysis is a popular method to analyze the meaning of visual symbols in the field of fashion and design, there are still other methods to analyze the meaning of visual language. Different methods of analysis may lead to different results.

6.4 Suggestions or Future Research

With the enhancement of the public's awareness of sustainability, the transmission of sustainable information in the brand window is important, so it is very valuable and necessary to continue the research on the transmission of sustainable information in the brand window.

According to the study, the sustainability in fashion supply chain from the perspective of environment and consumer service are predominantly reflected in the website and window design of sustainable fashion brands. In the light of literature review, sustainability in fashion supply chain is composed of four levels, 1) the environmental level (Moran,2013), 2) the economic level (Moran,2013), 3) the cultural and social level (Moran,2013), 4) the consumer service level (Gwilt, 2014). Therefore, in future work, the brand needs to reflect the sustainable information in the website in the shop window more comprehensively. For example, brands can increase sustainable information output in window design from economic perspective as well as cultural and social perspective. In addition, brands and designers need to study how the design of visual display is connected to sustainability communications.

On the basis of the research, in the current window displays, rhythm and line are the most popular visual merchandising methods. However, according to the theory of Pegler (2016), the visual merchandising

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methods. However, according to the theory of Pegler (2016), the visual merchandising methods of window displays are diverse and abundant. For example, rhythm, line, proportion, contrast, surprise, surrealism and so on. It can be concluded that most visual merchandising methods have not been used by brands to deliver sustainable messages in window design. Therefore, brands and visual designers can use visual merchandising methods to express sustainable information in a variety of ways, making the expression of sustainable information more appealing.

ACKNOWLEDGEMENTS

Acknowledgements

First, I would like to express my deepest gratitude to my advisor, MA Natalia Särmäkari, who patiently provided me guidance and constructive comments throughout the process of writing my thesis. She recommended relevant literatures based on my ideas to help deepen the knowledge around my thesis. My appreciation also extends to my supervisor Professor Mikko Jalas, who helped me find my research scope and helped edit my structure and writing. I shall extend my thanks to Naoko Nakagawa, who answered many questions about the curriculum, study, and so on. I also want to sincerely thank Dr. Owusu-Ansah K.G. and Keri Gregory for making this thesis an enjoyable read. Furthermore, thank you to Tongji University for providing me with the opportunity to

study and obtain a double degree at Aalto University. I was impressed by Aalto University's comprehensive design education system, supportive communication with students and rigorous academic attitude. At the same time, warm thanks to every teacher and classmate in the Creative Sustainability family for helping me through my studies. Moreover, thanks to my good friends Liangyan Shen, Yu Chen, Omar Eldaghar and Molly Raleigh for their help in my study as well as the happy memories they brought to me. Last but not least, thanks for all the support from my family. In summary, the study and living experience in Aalto University in Finland broadened my horizons and has had a profound impact on my life and will continue to influence my future.

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APPENDIX 1. Model of Semiotic Analysis

Signifier	Denotative Signified	Connotative Signified	Sustainability in Fashion Supply Chain Reflected in Windows
The object	First-order signification, Literal dimension of meaning creation (design method)	Second-order signification, meaning (the window display theme)	
Color			
Texture			
Prop			
Light			
Space			
...			



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